415835

THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXX.—No. 5. Whole No. 1,260. | NEW YORK, MONDAY, JULY 31, 1899. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Briefly Told 161

The Rate War in New York City—Notes.

Action of Gases on Caoutchouc 162

*Gas Piping Topics, by Gas Engineer 162

*The Evolution of the Hydraulic Main, by Mr. W. Carr 163

A Comparison of Platinum and Gas Thermometers, Including a Determination of the Boiling Point of Sulphur on the Nitrogen Scale 167

*A Method of Carrying out Chemical Reactions under High Pressures, by Mr. B. H. Hite 168

The Distribution of Electricity in Philadelphia 170

Pneumatic Propulsion 171

Gasfitting Regulations as Adopted Last Month by the Authorities of Brookline, Mass. 172

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 173

Mr. Miller Corrects His Remarks Anent the Naphthalene Discussion at the Western Meeting—Contract for the Berlin Iron Bridge Company—Bidding for the Bath (Me.) Works—Cheaper Gas for New Rochelle, N. Y.—Annual Meeting, Attleboro, Mass.—Personal—Capital Stock Increased, Quincy, Ills.—A Royalty Return, Des Moines, Iowa—Examinations, Mass. Inst. Tech.—Death of Mr. Lloyd Tevis—Annual Meeting, Greenfield, Mass.—Annual Meeting, Lansing, Mich.—Consolidation at Glens Falls, N. Y.—Hints from Lorain, O.—Contract for the Western Gas Construction Company—Public Lighting, Paterson, N. J.—Consolidation at Raleigh, N. C.—An Ordinance, Binghamton, N. Y.—Sale of the Waynesboro (Pa.) Works—Gas Lighting, Newport, Ky.—And Other Items.

Annual Report, Commissioner of Patents 174

Removing Lead from Pipe Joints 175

The Electrolysis Problem 175

The Market for Gas Securities 175

BRIEFLY TOLD.

THE RATE WAR IN NEW YORK CITY.—The gas rate war in this city, which was openly inaugurated by the Consolidated Gas Company the first day of last May, is still being conducted and managed by the financiers who brought it about. It is claimed that none of the Companies concerned in the combat is very active in canvassing for business at the moment, but meanwhile it is the fact that gas can be bought "officially," according to the location of the consumer, at prices ranging from 45 cents per 1,000 cubic feet, as the minimum, to 65 cents per 1,000 cubic feet, as the maximum. From the standpoint of those who are in executive control of the Companies, and of those who are being served with gas by the Companies, no doubt this state of affairs is pleasing and satisfactory, but there is a third person who is very much concerned in the matter, and that third person is the ordinary investor. An ordinary investor may be taken as one who, in good faith, after a fair investigation, purchases shares in a company, such purchases being largely influenced by the presumed straightforward caliber of the men under whose direction the company is. The ordinary purchaser may have gotten into his holdings at a time when the shares were not quoted at high prices, but, relying upon the honesty and commercial capacity of the concern's directors, he is satisfied to wait with its fortunes until the days of prosperity are at hand. In time such days arrive, and the golden period continues; the directors and executives of the concern in which he is interested of course remaining in office. Much success and some "strategy" have enabled the executives to acquire the belief that but for them the concern could not go on. Neglecting the signs of ordinary commercial practice, they keep the price of their commodity at a figure which tempts others to compete with them, and the "others" get in. The "others," having all to win and virtually nothing to lose, make trouble, with the result that the ordinary investor finds his trust was placed in men of straw, and whose standing had not even the coherency of unmixed sand. If our thoughts in this instance are fair, a brief mention of what has been said in connection with arguments over a proper charge for gas in New York city, offered within less than three years before the State Legislature, may be in order. The leading Companies, represented by counsel, when combating a proposition of the Legislature to put the gas rate at $1 per 1,000 cubic feet, testified that gas could not be sold in New York city at such a figure and enable them to make a fair return to their shareholders, whose interests they were bound "to protect." The result of their pleadings was the adoption of a graded scale, the operation of which in five years' time would oblige them to sell at $1 per 1,000 cubic feet. So far so good. In May, 1899, the Companies voluntarily announce that they can and will and do sell gas at anything from 45 cents per 1,000 to 65 cents per 1,000. Thus the ordinary investor would seem to be between the devil and the deep sea. For if his representatives told the truth before the Legislature less than three years ago they must be acting an untruth now, and to his detriment and loss. The ordinary investor, however, has a remedy, partial though it be, and long drawn out though it may. This remedy or relief can come through the courts in the regular way, by means of an action to prevent the waste of the funds of a corporation; and it is quite certain that unless this fool war-

fare is brought to an end speedily, such action will be instituted in good faith by people who care not a rap as to which faction wins, but who do care that neither faction shall win at their expense.

NOTES.—The new plant of the Consumers Gas Company, of Reading, Pa., was formally inspected by many representative citizens and gas consumers of Reading something less than a fortnight ago. Manager John H. Keppelman did the honors, which statement is a guarantee that nothing was left undone that should have been done. The plant is a model one in every respect, and it is up to forwarding an output of 1,500,000 cubic feet per day.——A correspondent in New Orleans, La., writing under date of the 24th inst., says: "Messrs. G. Q. Hall & Son, representing the first mortgage bondholders of the Meridian (Miss.) Gas Light Company, filed last week a petition to have the Company declared a bankrupt. The petition declares that there are now outstanding bonds of the corporation in the sum of $100,000; that the plant is not worth anything like that amount; that the values of the security are worth far less than the indebtedness; that the Company is insolvent; that while insolvent it paid off the claims of certain creditors, with interest, to prefer them over other creditors; and that certain moneys arising from the sale of bonds have been concealed, with intent to hinder, delay and defraud its creditors. The case will come up for hearing early next month."——We regret to have to chronicle the death of Mr. Frederick W. Odiorne, son of Mr. William H. Odiorne, the Superintendent of the Springfield (Ills.) Gas Light Company. Deceased, who was but a youth, succumbed to the exposure incident upon stormy weather encountered while sailing over the waters of Little Traverse Bay, in the vicinity of Harbor Springs, Mich., a noted summer resort, where the lad had been spending his vacation. The remains were interred in Oak Ridge Cemetery, Springfield, the afternoon of the 23d inst.——Mr. J. Nelson Patterson, well-known in connection with the distribution of natural gas in Westmoreland county, Pa., died at his home in Export, Pa., the morning of the 22d inst.——The Massachusetts Board of Gas and Electric Light Commissioners has issued an order on the petition of the Lee Electric Company for the right to emit bonds to the amount of $30,000 and to increase its capital stock in the sum of $10,000. The Company desired to refund $20,000 of 6 per cent. bonds for a like amount of 5 per cent. bonds, and to issue new securities in the sum of $20,000. The plea was this sum was necessary for the purpose of enlarging its plant, extending its lines, etc. The Board decided to permit the refunding of the $20,000 of bonds, and also authorized the Company to issue $3,000 additional new bonds, together with $9,000 of new capital stock, which increases the Board declares are "reasonably requisite for the work designed."——The new plant for the American Gas Company's property at Mount Vernon, N. Y., which is to be located on the east side of Eastchester creek, will be constructed without delay.——The agitation of a new franchise for the Hillsdale (Mich.) Gas Company is at an end. Under the agreement the Company is to exist for 30 years; but it may not charge more than $1.50 per 1,000 cubic feet for an illuminating gas supply, the charge on fuel account not to exceed $1.——"A. W. S." is informed that the proposed gas works for Hinton, W. Va., a charter for which was recently issued by the State authorities, is to be operated on an acetylene basis. The incorporators are Messrs. C. C. Lewis, Jr., F. C. Briscoe, C. B. Coyle and P. R. Thompson, of Charleston, W. Va., and R. H. Smith, of Hinton. The eventual authorized capital of the concern is $100,000, of which amount $500 were paid in.——Judge Studley, of the Common Pleas Court, New Haven, Conn., district, has issued an injunction restraining the proprietors of the Columbia Hotel, Ansonia, Conn., from installing an acetylene gas generator on their premises. The injunction was sought in the name of the Home Trust Company, which owns the Columbia Hotel building. Although it carries a heavy insurance, the policies thereof contain no provision for permitting the use of acetylene gas in the hotel, so the Company declined to accept the risk arising from such use. The case will be argued in the September term of the Superior Court, and its progress will be carefully watched by Eastern gas men.

Action of Gases on Caoutchouc.

M. D'Arsonvall, according to the *Journal of Gas Lighting*, finds that, at pressures varying from one to five atmospheres, caoutchouc absorbs large quantities of carbonic anhydride, and at the same time increases considerably in volume and becomes more gelatinous and less elastic. On exposure to air, the gas is gradually lost, and the substance resumes its original properties. In virtue of this property, vessels of caoutchouc readily allow carbonic anhydride to pass through their walls. The action is much slower in the case of oxygen, and is very slight with nitrogen.

[Prepard for the JOURNAL.]

Gas Piping Topics.

By GAS ENGINEER.

In piping to a reservoir it may be necessary to connect in a safety valve, in which case some calculations will have to be made. We may have dead weight on the valve, or we may have it in the form of a spring, which is the idea involved in the pop valve, or we may use a small weight and put it on the end of a lever, as in Fig. 1; and if we have 100 pounds at a leverage of 4 to 1 it will exert a down pressure of 400 pounds. Here is a force tending to lift a valve, and this force is the pressure-times the area of the valve, and all you have to do is to keep it closed. The simplest rule for figuring is this: Multiply pressure and area of valve and divide product by weight of ball or other weight at *C*. Multiply quotient by distance from fulcrum *B*, to center of stem *D*, and the product is distance from fulcrum to set ball. In other words, the total pressure on valve *A*, divided by weight of ball, gives the ratio of increased leverage. You can reverse the problem and tell what weight the ball should be at a distance, a certain number of times the distance from fulcrum to stem, by dividing the total pressure on valve by this ratio.

Pressure.—Gas that is confined in a pipe or cylindrical retort acts with a certain pressure in all directions. It pushes directly up and to every angle from the perpendicular, pushes on the heads and on the bottom as well, so that the pressure on the shell will be a certain amount on every square inch of that pipe or cylinder, and the total pressure will be the number of square inches it contains, times the gas pressure.

The bursting strain is the diameter of pipe times the pressure. The lower half of the pipe must never be considered as pulling in one direction and the upper half in the other direction, like two tug-of-war teams, the middle portion of the pipe having to stand both pressures. One pressure simply acts as an abutment against which the other one can push, so that the strain is only equal to what one side would give. From this you will see that one side of a shell must stand a strain when under pressure equal to one-half the diameter times the pressure.

Joints.—Girth joints are usually single riveted, but, if properly designed, are stronger than the double-butt strap, triple-riveted, longitudinal joint. If we take, for instance, a hollow cylinder of steel, we have an ideal shell, without heads or joints, 3-16-inch thickness of metal and a tensile strength of 4,000 pounds per square inch of section. If this shell is burst by pressure the fracture can run longitudinally its length along the largest diameter. At the moment of rupture the strain on the metal must be equal to its tensile strength. The area of plate to be broken is the length of the cylinder in inches times the thickness, and the strain on each inch is 4,000 pounds at the moment of rupture. The total pressure tending to force the two halves of the cylinder apart is equal to the pressure per square inch multiplied by the area of the cross section of the cylinder or pipe. Those not familiar with this sort of calculation sometimes find it hard to understand why the surface of the shell is not used instead of the area of cross section. The answer is that the pressure on the upper half, for example, does not all act in the same direction owing to the curvature of the shell. The pressure on parts that are close to the center line acts almost horizontally, while on the parts lying along the top of the pipe or shell it acts vertically.

Jacks.—Useful forms of making wood connections in the construction of jacks for putting up gas pipe systems are shown in Figs. 2 and 3. A plan for double-split wedgings is shown in Fig. 2, in which the tenons are divided and the wedges *E E*, driven firmly into place, as shown. The design of joining represented by Fig. 3 is effected with a bolt and nut, *F*. The body piece is bored straight for the bolt, and the joint is made by cutting a cavity in the second piece, as shown. The nut is prevented from turning by the sides of the cavity, so that by turning the bolthead the pieces may be drawn together and secured with great firmness.

The Air Pump.—All duplex pumps having rods pressed and riveted into pistons, as at *G*, Fig. 4, should not be allowed to pass without having such changed to rods screwed and riveted into pistons, as at *H*, Fig. 5; otherwise trouble with these working loose will almost invariably result. All air cylinders should be left bare to reduce as much as possible the high temperature resulting from compression. At the most, none other than a ventilated cylinder cover of netting, perforated steel or similar material, as illustrated, should be employed.

In repairs to 6-inch pump an oil cup should be placed in top air cylinder head at left of stuffing box. These, and 8-inch pumps with-

out, should have plugs placed in lower air cylinder head to facilitate removal of reversing valve and stem on pumps.

Reversing valve stems of all pumps with steam cylinders above should be drilled and tapped for ¼-inch bolt; that the latter, or tool illustrated, may be employed in removal of this part, when necessary on road or in round house.

The Jet Condenser.—In some plants they operate a jet condenser by the duplex and for the purpose of condensing to form a vacuum on the opposing side of the piston of a pump. The condensing chamber of a jet condenser is shown in Fig. 6. Connection is made with the exhaust

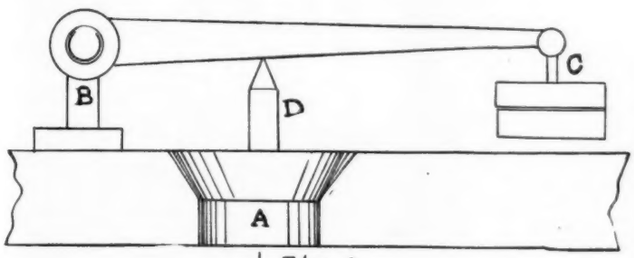


Fig. 1

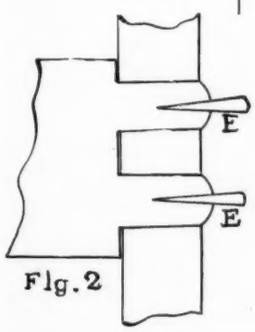


Fig. 2

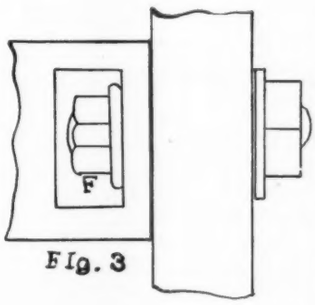


Fig. 3

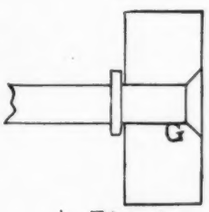


Fig. 4

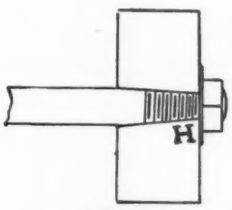


Fig. 5

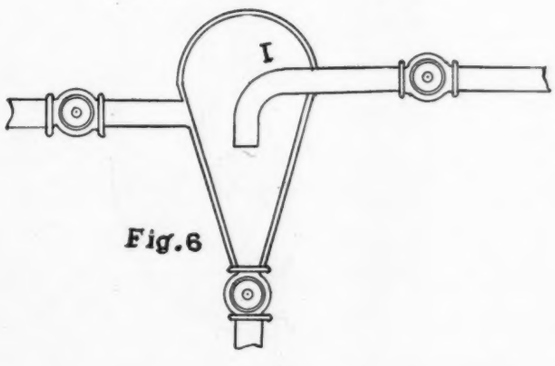


Fig. 6

by a pipe, while the injection pipe which conveys the material for condensation purposes into the injection chamber is marked *I*. Place drain valves at bottom of column and gauge glass, and drain pan under by cocks, piping all to it. Use brass pipe and fittings to permit of easy removal for repairs.

Points in Repairing.—Anneal all pump bolts and air ends of piston rods by heating to a dull red, and then placing in the lime until cool. As soon as removed from fire, examine carefully for cracks, such then being easily discernible. When heated no more than advised, scale will not form.

In annealing the copper gaskets, if, before heating, they are wet and sprinkled with common salt on each side, they will come out of the water almost as clean as new material.

The Evolution of the Hydraulic Main.

[A paper read by Mr. William Carr, of Stalybridge, England, at the 36th Annual General Meeting of the Incorporated Gas Institute.]

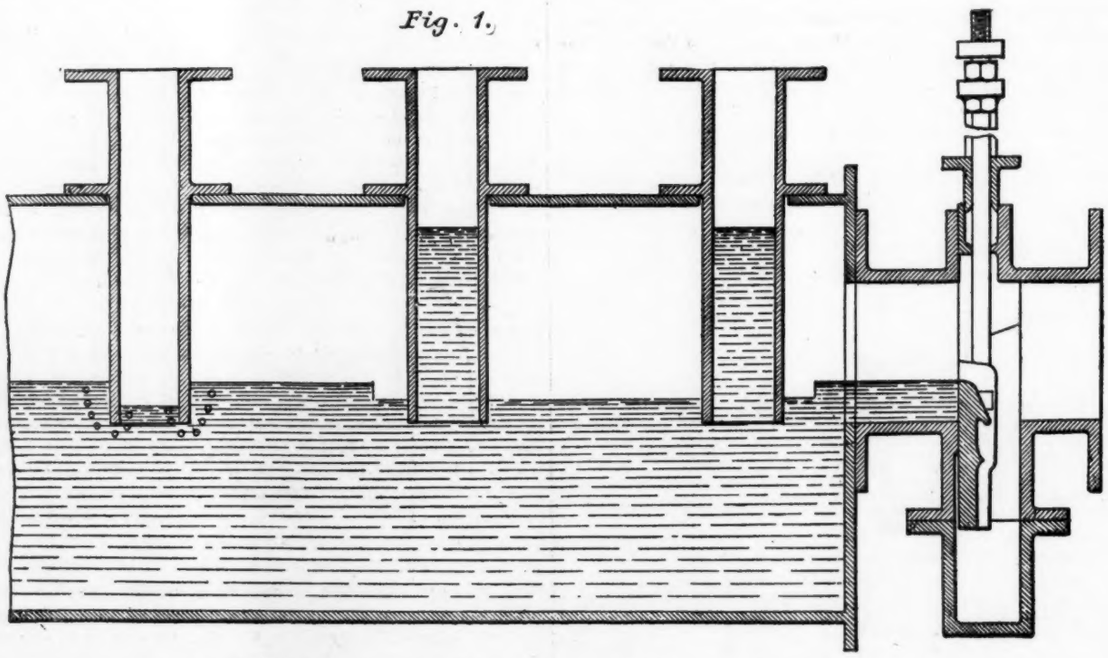
The part played by the hydraulic main in the economics of gas manufacture has been so quiet and unostentatious that its importance in a great measure has been overlooked. In the beginning the hydraulic was nothing more nor less than a machine or physical contrivance for trapping the gas when once it had passed that particular point and preventing its return; and I am afraid that it is nothing more to-day to a vast majority of those who are engaged in the business of gas making.

I do not know who was the inventor of the hydraulic main, or whether there was such a man or not. It was probably the outcome of laboratory traps that had been in use before gas was thought of. Be this as it may, it remains the one unique and perfect machine in connection with gas apparatus. Physically speaking, it is without flaw or defect of any kind. This machine or instrument was designed before the days of exhausters, when the whole of the back pressure was upon the retorts, and when it was thought prudent to use iron retorts to prevent any waste consequent upon the large amount of pressure under which the retorts had to be worked. It will readily be seen that the part to be played by the hydraulic main in those days was one of great importance. It had to give free way to the gases when generated; and it had to form a perfect barrier to the return of those gases during the time of drawing and charging, even though the pressure on the main itself might be anywhere from 10 to 20 inches. How beautifully this instrument discharged all these duties will be apparent to all of you. How the area of the main was so nicely calculated, in comparison with that of the dip pipes, that a depression of 1 inch in the main itself would supply sufficient water to fill up the dip pipes to a height of 15 or 16 inches (as shown in Fig. 1) is a matter with which you must all be familiar. You will observe the old-fashioned weir valve at the end where all the water and the surplus tar were taken off along with the gas; some gas engineers taking them on a tortuous passage round the retort house under the mistaken notion that the gases would thus be enriched, or that the formation of naphthalene would be minimized in some way. I have no doubt that in many works the arrangement still obtains, although the ideas which brought about that arrangement may have been superseded by later knowledge.

Had it been that only water found its way into this main, it would still have remained the most perfect instrument that could be designed for the work it was intended to do; and to-day I consider it the very best thing that can be used in a products works. At places where small coal is consumed for the sake of the coke, tar and ammonia that can be extracted, and where gas is of no value or only of value as a heating agent, it will be found to be a very efficient instrument; for, in addition to its advantages as a hydraulic trap, it is a tar making machine of the first water. As time advanced, however, people engaged in the manufacture of gas began to aim at getting better results. The exhauster was introduced, which made clay and brick retorts and ovens feasible, and higher temperatures of distillation came in vogue; and then it was that the hydraulic main began to assert itself, at first by getting blocked up with salts and very thick tar—the whole mass in some instances becoming quite solid—and later by its apparent effect on the choking of the ascension pipes. In 1872, Mr. George Livesey read a paper before this Institute—or, as it was then called, the Gas Managers' Association—on the subject of hydraulic mains; and this, so far as I know, is the only time that the matter has ever been under the consideration of the members of this Institute down to the present. Mr. Livesey had been having trouble with his hydraulics getting blocked with pitch and salts, and he was led, by reasons which need not be gone into, to design a form of main shown in section in Fig. 2. In the course of the paper he makes use of the following observations:

Various means have been tried to prevent or clear out this accumulation of thick tar, one being an enlargement of the hydraulic itself till, in one case that I have seen, each length would make a small Cornish boiler; then the elevation of the hydraulic from 2 to 4 or 5 feet above the brickwork with the object of removing it beyond the reach of heat—it being considered that the heat from the setting converted the tar into pitch. A stream of gas liquor has in some cases been caused to flow through the main, and for a long time I had a quantity of hot water from the steam boiler put into the main once or twice a week. But this did very little permanent good. The making the main deeper and square at the bottom has been suggested; means for drawing off the tar from the bottom instead of the top have been devised and used with varying success; but by no plan, so far as I am aware, has the prevention of this accumulation been certainly and completely obtained. The

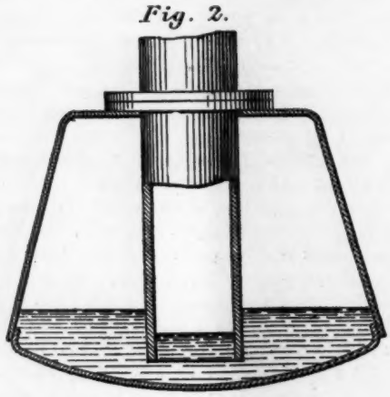
Fig. 1.



causes of its production are twofold: First, the retention of the tar in the main, and, second, the heat of the gas from the retort, in passing through this comparatively stationary tar, evaporating its volatile constituents. *For it is the hot gas, and not the radiated heat from the setting, that does the mischief.* [The italics are Mr. Livesey's.]

Judging from the tone of the paper, Mr. Livesey seems to have been very proud of this invention; and the main itself seems to have been very successful in its operation. But at this time the average make of gas at the South Metropolitan works would not exceed 9,500 cubic feet per ton of coal carbonized. It was even held by some eminent engineers that it was impossible to obtain more than that from a ton of coal without a greater or a corresponding loss of illuminating power; so that, under these favorable conditions (I mean favorable to the hydraulic main), it is easy to understand that Mr. Livesey's improved main was a complete success. Progress, however, could not be stayed at this

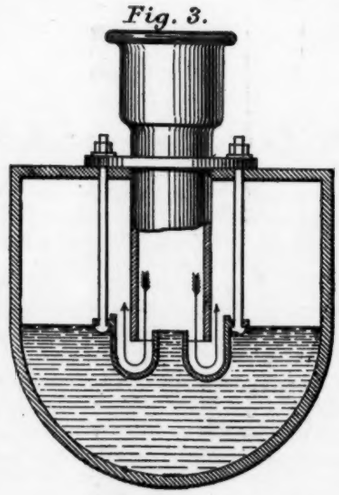
Fig. 2.



juncture, and it began to dawn upon some of the more thoughtful that the hydraulic played a much more important part in the results obtained from the distillation of coal than had previously been suspected. At first the slight amount of back pressure thrown on the retort in consequence of the seal was supposed to be a deterrent. Then again, the pulsation caused by the bubbling of the gas through the liquid in the main was supposed to have a baneful influence, especially in regard to the deposit of carbon on the sides of the retort; and so the idea got abroad that if the dip could be done away with much good would result.

A number of engineers of a mechanical turn of mind commenced devising means to remove the dip, and there followed a long series of patent anti-dips. One of the earliest of these (shown in Fig. 3) was Hawkins' patent. I was greatly impressed with it when it first came out, and studied it carefully for a long time. I was sure there was something in it, because it was the subject of a patent; and I was equally sure that it was something very clever, because I could not understand it. However, by dint of long cogitation, I came to the conclusion that it was undertaking to do something that was not in harmony with the law of physics; and so I did not pursue it any further. But, at the time, it made a great impression on my mind; and as a pointer of the direction in which we ought to travel, it did me a great service. Along with others I tried several of these anti-dips experimentally, and it soon became apparent that wherever you could get them to work satisfactorily the results were improved. I did not satisfy myself, however, as to which particular form to adopt until I saw an arrangement

Fig. 3.

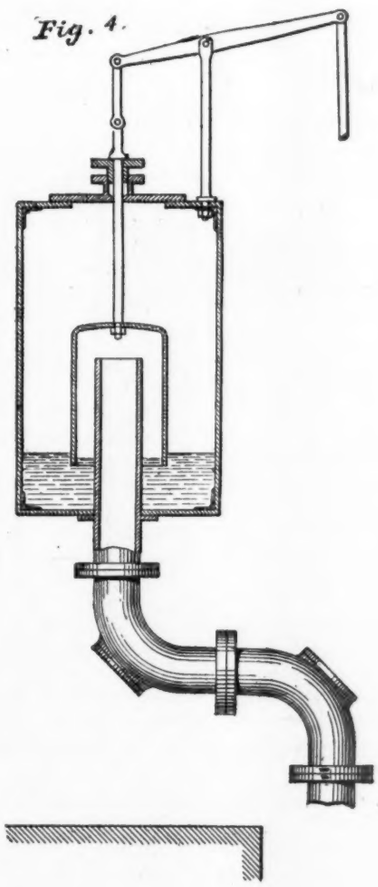


that was working at the York Road gas works, Leeds (see Fig. 4). Mr. Henry Woodall, the then Engineer, told me it was not the subject of a patent, and that I was at liberty to make what use I liked of it; and so I adopted it—first to 80 mouthpieces, and subsequently to a further 80, with varying results. I believe that Mr. Woodall was afterwards admonished for having adopted it, and ordered to take it out by an all-wise Gas Committee.

As with all other forms of anti-dips, trouble began with the removal of the seal in the way of pitchy deposits all about the apparatus itself and in the hydraulic main, and very often causing the ascension pipe to get choked up to an abnormal degree. I have had the annular space betwixt the bell and the ascension pipe so firmly blocked with hard pitch that the cast iron bell has had to be broken before it could be got off. It was probably something of this kind that caused it to become unpopular at Leeds. With my first application of this anti-dip, I

placed the main close down upon the retort stack, and the ascension pipes entering the main at the bottom, the gas was out of the ascension pipe and out of the main itself before sufficient time had been allowed for cooling. The trouble I had with this arrangement was of the most grievous kind ; but with the application of the second lot I placed the

Fig. 4.



main 4 feet higher—almost doubling the length of the ascension pipes, in the case of the top retorts. This proved so satisfactory in its working that I was not long before I exalted the first lot to a similar position ; and, with careful handling and a little more care in the regulation of the heat of the retorts, we gradually got it into a workable instrument, and from that time it did me very good service. Finding I could get much better results, more especially with regard to the illuminating power of the gas produced, the question naturally arose as to the why and the wherefore; and I was eventually led to the conclusion that it was the presence of tar in the old hydraulic that caused the results to be poorer where it was used than was the case with removable dips. Had I been familiar with the most advanced thought and practice at that time, I should have known this, and much cogitation might have been saved.

The Rev. W. R. Bowditch, in his book upon coal gas, published 1867, has the following observations on the action of tar :

The hydraulic main ought to be kept at a proper temperature and to be prolonged sufficiently to allow the less volatile bodies to condense and pass away to the tar well, and the more volatile to go forward with the gas; or, what is much better, a special apparatus, kept at a regulated temperature, should be interposed between the hydraulic main (in this case kept hot, of course) and the purifying apparatus, in which the gas and lighter hydrocarbons might be separated from the heavier bodies, and so a larger proportion of hydrocarbon vapor might be distributed with the gas. In other words, the gas might be made more illuminating. If thus separated, there would be no difficulty in distributing all the light hydrocarbon vapor which the tar would give up, as may be proved by the well known process of pouring naphtha into the mains, which the gas picks up on its passage and carries to the consumers. Gas at common temperatures can take up and carry a considerable quantity of the vapor of the lighter hydrocarbons, if they be brought into contact with it after having been separated from the heavy ones. But the power of the heavy to carry down the light is greater than that of gas to carry them on ; and hence all fall together in the present system of condensation, to the great detriment of the gas. The loss of light which gas suffers upon being passed through cold, heavy oil, and the inability of the same oil when heated to act upon it, will illustrate this. I have passed gas through heated heavy coal oil boiling about 400° F., and have found its illuminating power identical with its illuminating power before it was passed through the oils. It gave up nothing to them and it took up nothing from them. I have also passed gas through the same kind of oil at ordinary temperatures, and have had its illuminating power reduced to less than 1 candle for a consumption of 5 feet an hour, whereas before passing the gas through the oil it had an illuminating power of 13 candles. The cold oil has dissolved out of the gas nearly all its illuminating matter.

I have given this long extract because I think it is an exact description of what takes place in the hydraulic. At any rate, I had arrived at a similar conclusion myself without having seen or heard of Mr. Bowditch's book, which you will observe is exactly opposite to the one enunciated by Mr. Livesey. If Mr. Livesey's remarks applied only to the negative gases that come off at the end of a charge, or to furnace gases that may be drawn through leaky retorts by the action of the exhauster, I should agree with him entirely; but it is not so with the rich gases that come off in the earlier stages of distillation. In this case, the heavy tar or pitch liquefies at 400° F., or thereabouts; and if it can, will separate itself from the gas. But if afterwards the gas be brought into intimate contact with it, it will absorb the light oils from the gas ; its power to do so, as Mr. Bowditch says, being greater than that of the gas to carry them forward. And this no doubt is the secret of all the nasty stoppages which followed the adoption of the anti-dips of various kinds. Once you got the gas passing the hydraulic at a temperature of anything over 200° F., you would have nothing but pitch or a very thick tar deposited there. The light oils in the gas not coming in actual contact with it, it has no chance of absorbing them, and so after a few days' baking at a high temperature, it would, and did, become absolutely solid.

My brother, in carrying out his tar process, has experienced exactly the same trouble at Widnes, because he conducted the gases after leaving the duct directly into the foul main without any intercepting seal. The pipe leading from the duct he is obliged to have water jacketed, in order that the temperature of the gases may be reduced so low before going one step further that sufficient of the light oils will be condensed to mix with the pitch, to enable it to flow. Otherwise he is liable to have his foul main completely blocked ; and this unavoidably happens whenever the circulation of the water in the jacketed pipe is interrupted or neglected. And so it will invariably happen in any portion of the apparatus, whether it be ascension pipe, hydraulic main, or foul main, if the gas passes through it at a temperature of over 300° F.

The deduction from all this is obvious. You must bring your gas into the hydraulic main at a temperature not greatly exceeding 200° F., if you wish to use a water seal or anti-dip. Before I had learned this much, however, I made many futile attempts to convert some old mains in which we had been working with a tar seal into water seal. I tried flushing with liquor, diaphragms to block the liquor and only pass the tar beneath, and mechanical arrangements for trapping the tar, of which I felt very proud and hopeful at the time. The success obtained, however, was very indifferent. Whenever I got the heats to anything like what I wanted, the result was invariably pitch, pitch, pitch. I have seen many similar appliances to those I tried make their appearance since as novelties, and I have smiled to think that some one was travelling over the same old road. We had got fairly well away with the new hydraulics, and went along swimmingly until 1881, when we introduced the regenerative system of firing, by putting in two sets of 32 mouthpieces to the design of Mr. Klönne, and three sets of 48 mouthpieces to the design of the late Sir W. Siemens ; and these sets were put up where the Leeds arrangement of hydraulic main was in use. Up to this time I had held the opinion that retorts could not be made too hot for the proper distillation of coal for gas making purposes ; but a new light was destined to break in upon me. I gave these furnaces their head. "Get them hot, and let us see what they can do," was my instruction to the workmen. In three weeks I completely ruined one set, and I greatly impaired the usefulness of the other four ; but the trouble we had with the ascension pipes and the hydraulic main was a revelation. I was reminded of it the other day, when a neighbor of mine told me they had at their works twelve men per shift working in the retort house—four of them were stokers and the rest pipe cleaners. This was on regenerative settings also. I managed after a time to get the setting to work with a fair amount of success ; but the stoppages

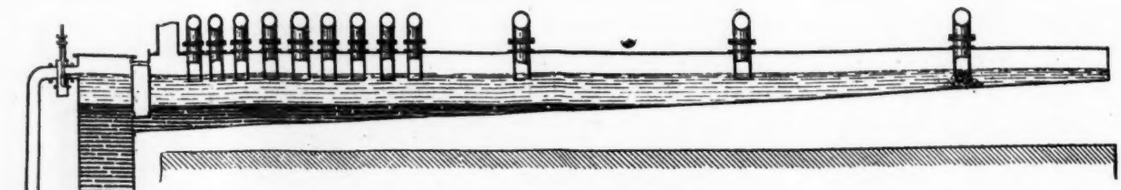


Fig. 5.

Fig. 6.

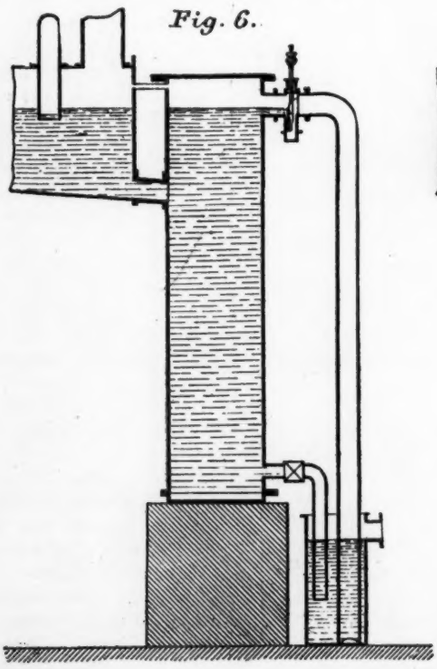
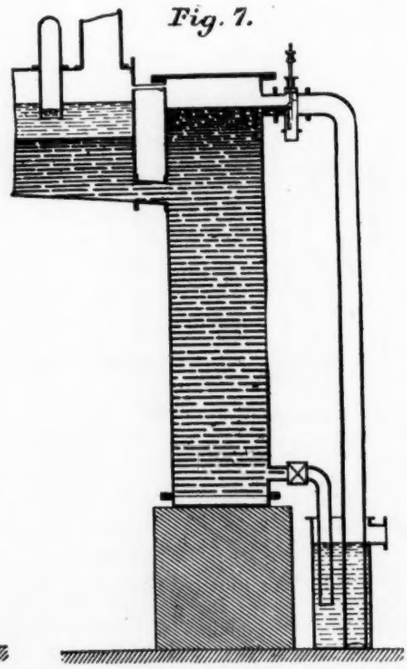


Fig. 7.



occurred so frequently, even with the greatest care, that I determined to try a new departure in the way of a hydraulic main.

The conclusion now arrived at was that it was wise to keep in the gas the whole of the light oils that the gas was capable of carrying; also that it was necessary to take out sufficient to liquefy the heavier tar or pitch that first fell down, in order to give it power to flow by gravitation to the wells, and to be of such consistency that it might afterwards be pumped from the wells. Here was a plain issue to be solved. Whether the efforts made have resulted in a solution or not it is difficult to say; but they have at least gone some distance in that direction. When a fresh charge of coal is put into a retort, the gases that come off in the early stages of distillation must come off at a comparatively low temperature; and the light oils as well as the heavy oils will fall together for a time. As the temperature rises, only the heavy will fall; and towards the end of the time of distillation the gases carry scarcely any vapor capable of liquefying at normal temperatures, but are capable of taking up from the pitchy matter deposited on the sides of the ascension pipes, or elsewhere, any oily matter it may contain and converting it into a solid, or, at least, a very hard substance. Until the temperature of the gases be reduced to something below 200° F., they are capable of doing this at any point. A perfect instrument would be a telescopic ascension pipe that could be closed at the beginning of the distillation process and gradually elongated as it proceeded; so that the effluent gases should never enter the hydraulic at a temperature exceeding 200° F. But as that is so far practically impossible, the object to be aimed at was to utilize the light oils that must fall to help off the heavy that you were compelled to dispose of, and later to reserve all the light oils that you could for the purpose of enriching the gas. The question of keeping the light oils in the gas after getting them safely past the hydraulic, I will not attempt to deal with to-day. It is matter enough for another paper.

After what I have said about the difficulties encountered, and my progress educationally towards a more complete knowledge of the functions of a hydraulic main, it will scarcely be necessary to give you my reasons for going in for the special kind of main eventually adopted. The main itself is illustrated in Fig. 5. It will be seen at once that it is very orthodox, inasmuch as the pipes go into the main at the top in the old way, and there is great depth, especially at the outlet end. The sloping bottom of the main is intended to keep the tar on the move, while still in a liquid state, towards the outlet. When it gets there it either mixes with the other tar already accumulated, or passes forward into the standpipe or tower (shown in the illustration) for receiving the same; and as some of the tar already accumulated will probably be of a fairly liquid character, it assimilates with it and helps to move the heavier tar along. It will be seen also that any light tar falling in the early stages of distillation must inevitably encounter the thick tar of some other stage; and so far it is a perfect self-acting machine carrying into effect the theory I had elaborated.

The illustrations, Figs. 5, 6, 7, show it in different stages of work; the first (Fig. 6) entirely filled with water; the second (Fig. 5) partially filled with tar; the third (Fig. 7) with tar overflowing. One of the drawbacks attending the latter stage is that the different specific gravities of the two columns will cause the level of the water to be raised, but that is not a serious defect. We have had some little trouble with the large pipe at the shallow end of the main. The pipe being short, and having to serve two retorts, the gases must often be going into the main at a much higher temperature than that at which it is safe or wise to work; and the result has been the formation of a pyramid of pitch, as shown in the drawing. Now, although these conditions must as regularly have occurred with the other three pipes, we have rarely been troubled with the second one, and never with the third and fourth: proving conclusively that the thin tar formed at the same time in other parts of the main, and traveling towards the deep end, has been sufficient to carry off the pitch formed in that portion. Whenever this pyramid has formed, it has required crowbars and sledge hammers to remove it. It is my intention to raise the bridge pipe in the case of the pipe at the shallow end 18 inches higher, which I think will prevent any recurrence of the pyramid trick.

The first application of this main was to a bench of five beds of retorts, settings of nines (three threes); one ascension pipe having to do for two retorts, the top and the middle center, which were connected together by a short branch betwixt the two mouthpieces. These settings were heated with regenerative furnaces of my own design, and worked at very high temperatures; but after working six months, an iron rod dropped down the dip-pipe at any point of the main would ring on the bottom as though it had never had anything but water in it. It met

the same fate, however, as the Leeds anti-dips. After I had left the place for a time, I was told that it had been relegated to the scrap heap. But when I commenced work at Stalybridge, I put in a new installation of regenerative settings, and I applied this arrangement of hydraulic main throughout; and during the last three years the whole of the gas made at those works has been passed through them. Our practice has been to open the 4-inch valve at the foot of the tower, and run away the whole of the tar once every 24 hours, and fill the main up again with water. Sometimes the tar has been so thick that it has taken several hours to run off. At other times I have had to resort to the use of cannel to help to liquefy the stuff in the main. As I have furnaces only on one side of my retort stack, I have always used the cannel on that side; so that the coke from it could be consumed in the furnaces, and not interfere with the quality of the coke I had for sale. The tar from the mains on this side was invariably much thinner than that produced on the opposite side, where only coal was used.

I have already mentioned one of the defects of this main, viz., the extra back pressure when tar is overflowing. It has several others; the principal being the careful handling required in running off and refilling. Another is the danger of getting the tar so stiff that it will not flow at all; but this is common to all forms where the manager tries to sail too close to the wind in the matter of high heats and large yields. In filling up after running the tar off, it is necessary to fill right up so that the pipes are sealed. We have left it rather short on several occasions in the belief that it would fill itself up before the time of the next draw; but it never does this. When the hot gases are playing on the surface of the water without bubbling through it, the evaporation which takes place is greater than the liquid deposits from the gas; and they might be fraught with serious consequences if overlooked. But, given the requisite care and attention, it is a very efficient instrument indeed. There need be no question of enrichment where only 16-candle gas is required if a main of this kind was in use—that is to say, if Newcastle or South Yorkshire or Lancashire coal be used. I have seen many samples of coal in the Transvaal that would not make 16-candle gas under any circumstances; and there may be some in this country. But speaking of the coals of this country of which I have had experience during the last 30 years there should be no difficulty.

Bearing on this point, I had a sample of tar taken from one of these siphon pots on the 17th of May last, and found, after passing 10 feet of gas through it from one test holder to another, that 3½ candles had been taken out of the gas. This experiment was so interesting that I determined upon a series of more carefully conducted tests; but the results worked out with such sameness and regularity that it will not be necessary for the purposes of this paper to give more than one. On the 23d of May last, a sample of tar was taken from the siphon pot of one of the mains in operation, and, owing to some defect in the flues, the sets at work on this main were, and had been for more than a week previous, working at a low heat, so that the tar was what we considered exceptionally thin. It was 42½° Twaddel at 60° F., or 1.2125 specific gravity. Of this tar 32 ounces were carefully weighed in a Wolffe's bottle, and 10 feet of gas made to bubble through; the gas being taken from the street main after it left the gasholder. The quality of the gas in the first test holder was 19.75 candles, as tested with a Thorp and Tasker jet photometer. After it had passed through the tar into a second test holder, the quality, by the same photometer, was 16.75 candles; and when weighed afterwards the tar was found to have increased in weight to 32.331 oz., and the specific gravity to have fallen to 41½° Twaddel, or 1.2075 at 60° F. I had about half-a-dozen tests made; but the variation was very slight.

For curiosity's sake, I had a sample of tar taken from the outlet of the condenser (horizontal flat screw) and treated in the same way. To my surprise, I found that this affected the gas in the same way, only to a much smaller extent. The specific gravity of this tar was 18.2° Twaddel, or 1.091. Ten feet of gas was passed through 32 oz., or thereabouts. The quality of the gas in the first test holder was 19.25 candles, and in the second holder it was 18.75—the same photometer being used in both cases; and the specific gravity of the tar afterwards being 18.1° Twaddel, or 1.0905. During the winter, having some difficulty in moving the tar from place to place on account of its stiffness, I thought I would like to have it tested for specific gravity, and I found it to be 1.232, or 464° Twaddel—rather high for commercial tar made from a mixture of coal and about 18 per cent. cannel. Below I give you the commercial analysis of the tar produced at the Stalybridge gas works over a lengthened period, and that from some of the larger and more important works in the district.

I cannot (for obvious reasons) give the names of the places from whence these various tars have been obtained with the exception of my own; and here I am fully conscious that the information I am giving may be used to my detriment. But of such importance do I consider the information that I have determined to risk it. More especially is it important in the light of modern development of gas manufacture, when the most eminent of our gas engineers, or, at least, those who occupy the most eminent positions, go to America for systems of enriching—systems that are admittedly expensive, and that involve the the use of oil from America or from Russia—while the best of all material is at hand and requires only the application of brains to utilize it.

	Water.	Naphtha.	Light Oils.	Creosote.	Anthracene.	Pitch.		Loss.	
	Galls.	Galls.	Galls.	Galls.	Lbs.	Cwt.	Qrs.	Qrs.	Lbs.
Stalybridge.	12	5	2	42	13	13	3	1	21
A	9	5	8	50	14	12	..	1	26
B	9	5	6	49	13	12	3	1	10
C	11	7	7	45	14	13	..	1	12
D	6	5	13	54	10	12	2	1	14
E	7	7	14	50	12	12	..	1	21
F	..	7½	13	50	10	12	..	..	..
G	..	4½	18½	52½	10	12	2	..	..
H	..	5½	8	47	13	13	1	..	..
I	..	5	6	40	12	13	2	..	..
J	..	10	20	47	13	11	2	..	..
K	..	3	3½	40	12	14	3	..	..

A Comparison of Platinum and Gas Thermometers, Including a Determination of the Boiling Point of Sulphur on the Nitrogen Scale.

[An Abstract Account of Experiments made in the Laboratory of the International Bureau of Weights and Measures, at Sevres, France, by Drs. J. A. Harker and P. Chappuis.]

In 1886 Professor Callendar drew attention to the method of measuring temperature, based on the determination of the electrical resistance of a platinum wire. He showed that the method was capable of a very general application, and that the platinum resistance thermometer was an instrument giving consistent and accurate results over a very wide temperature range.

Callendar pointed out that if R_0 denote the resistance of the spiral of a particular platinum thermometer at 0°, and R_1 its resistance at 100°, we may establish for the particular wire a temperature scale, which we may call the scale of platinum temperatures, such that if R be the resistance at any temperature T°, this temperature on the platinum scale will be—

$$\frac{R}{R_1 - R_0} \times 100 \text{ degrees.}$$

For this quantity Callendar employs the symbol *pt*, its value depending on the sample of platinum chosen.

In order to reduce to the standard scale of temperature the indications of any platinum thermometer, it is necessary to know the law connecting T and *pt*. These are, of course, identical at 0° and at 100°, but the determination of the curve expressing the relationship between them is a matter for experiment.

The work of Callendar had established for a particular sample of platinum the relation—

$$d = T - pt = \delta\left[\left(\frac{T}{100}\right)^2 - \frac{T}{100}\right]$$

over the range 0° to 600°, T being measured on the constant pressure air scale.

Later experiments by Callendar and Griffiths showed that this relation holds for platinum wires generally, provided they are not very impure. They propose that the value of δ, the constant employed in the formula, should be determined by taking the resistance of the thermometer in the vapor of sulphur. A new determination of this point on the air scale made by them gave 444.53° as the boiling point under 760 m.m. pressure.

The present paper is the outcome of the co-operation of the Kew Observatory Committee and the authorities of the International Bureau of Weights and Measures at Sèvres, for the purpose of carrying out a comparison of some platinum thermometers with the recognised international standards.

A new resistance box, designed for this work, and special platinum thermometers, together with the other accessories needed, were constructed for the Kew Committee, and, after their working had been

tested at Kew, were set up at the laboratory at Sèvres, in August, 1897. The comparisons executed between these instruments and the standards of the Bureau may be divided into several groups. The first group of experiments covers the range—23° to 80°, and consists of direct comparisons between each platinum thermometer and the primary mercury standards of the Bureau. Above 80° the mercury thermometers were replaced by a gas thermometer, constructed for measurements up to high temperatures. The comparisons between 80° and 200° were made in a vertical bath of stirred oil, heated by different liquids boiling under varying pressures. For work above 200° a bath of mixed nitrates of potash and soda was substituted for the oil tank. In this bath comparisons of the two principal platinum thermometers with the gas thermometer were made up to 460°; and with a third thermometer, which was provided with a porcelain tube, we were able to go up to 590°. Comparisons of the platinum and gas scales were carried out at over 150 different points, each comparison consisting of either ten or twenty readings of the different instruments.

By the intermediary of the platinum thermometers a determination of the boiling point of sulphur on the nitrogen scale was also made. The mean of three very concordant sets of determinations with the different thermometers gave 445.27° as the boiling point on the scale of the constant volume nitrogen thermometer, a value differing only 0.7° from that found by Callendar and Griffiths for the same temperature expressed on the constant pressure air scale.

If for the reduction of the platinum temperatures in our comparisons we adopt the parabolic formula, and the value of δ obtained by assuming our new number for the sulphur point, we find that below 100° the differences between the observed values on the nitrogen scale and those deduced from the platinum thermometer are exceedingly small, and that even at the highest temperatures the differences only amount to a few tenths of a degree.

Full details as to the instruments employed and the methods adopted are given in the paper.

A Method for Carrying Out Chemical Reactions Under High Pressures.

By Mr. B. H. Hite, in *Am. Chem. Jour.*

The great majority of chemical reactions are carried out under ordinary, or atmospheric, pressures, which happen to be really very low pressures. Even in the comparatively few cases in which somewhat higher pressures are used, as those accomplished in an autoclave or Carius tube, the effect of the pressure cannot be determined on account of the elevation of temperature necessary to obtain the pressure. There is no convenient practical method, certainly none in general use, that is independent of the temperature and applicable to a very wide range of pressures. The lack of such a method or apparatus is the more noticeable in view of the long list of devices available for studying the effect of temperature. That most reactions are far more susceptible to slight changes of temperature than to what might perhaps be regarded as comparable changes in pressure is doubtless true, and it may be that the relative importance of these two agents is indicated fairly enough by the usual laboratory equipment, and yet before taking this for granted it would seem that, inasmuch as available temperatures have been extended to the fusing point of carbon, there ought to be one method at least in which available pressures would be limited only by the crushing strength of steel.

Such a method should be applicable to reagents in solution, in quantities suitable for experimental purposes, and, if possible, in glass or platinum vessels. There must be no leaking under the pressure applied, which must be absolutely independent of the temperature used. A description of such a method follows:

A platinum tube *T*, Fig. 1, 4 inches long by ¾ inch in diameter, and similar generally to the ordinary collapsible lead (or tin) paint tubes is filled with the solution of the reagents, closed with a stopper or screw cap, and placed in a lead tube about 1¼ inches in diameter by 5 or 6 inches long. The lead tube (see also Fig. 2) is then filled with water closed with a lid *L*, and placed in a steel cylinder *C*, about 7 inches long by 6 inches in diameter, with a hole through it about 1¼ inches in diameter. The lead tube rests on a steel plug *O*, which closes the lower end of the cylinder and rests on the bedplate *B*, of a powerful hydraulic press, while the pressure exerted by the ram *R* of the press is communicated by means of a steel piston *P* to the lead tube and its contents.

The platinum tube simply serves to separate the reagents within from the water surrounding it. It may be made very similar to the collapsible tubes mentioned; indeed, these tubes may be very conveniently substituted whenever the reagents to be used will not attack them. Several thousands of these tin tubes were used in studying the effect of pressure on solutions containing bacteria, and found to be entirely satisfactory. The platinum tubes should be made of very thin foil, so that on relieving the pressure the liquid within the tubes, expanding to its original volume, may not injure the screw caps or displace the stopper used in closing the tubes. The wide-mouth tube *T*, shown in Fig. 2, is a very convenient form, as it is easily filled and emptied, and

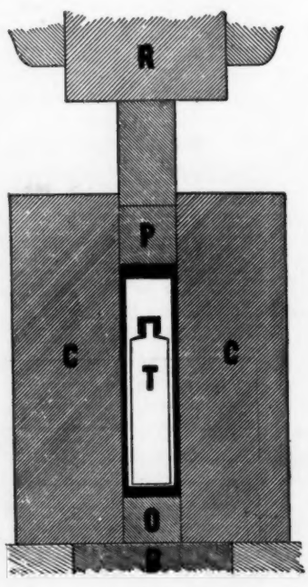


Fig. 1.

Fig. 2.

the dents which have a tendency to accumulate may easily be removed. The walls of this tube are reinforced for about an inch from the mouth to make them firm enough to hold the stopper *S*, which is provided with a small opening through which may escape any excess of solution, or any air bubbles that might otherwise be inclosed, thus permitting the stopper to be forced securely into the mouth of the tube, when the small opening is closed, as shown, with a small platinum plug.

The lead tube, which is the packing of this device, is securely sealed by the pressure, so that the liquid is completely encased in one continuous piece of metal. It is this continuous metal packing that is responsible for the high pressures obtainable by this method. On removing the pressure, the water, in expanding to its original volume, will sometimes loosen the lid of the lead tubes, and if a high pressure has been used the lead tube, in stretching to its original capacity, will sometimes be pulled completely in two; but as nothing but water can escape in either case these are not serious matters. There is absolutely no trace of leak while the liquid is under pressure.

The cylinder *C* should be made of the very finest tool steel. The hole through it must be true and smooth, and must fit accurately the plugs or pistons, *O* and *P*, which must also be made of the very finest tool steel and tempered hard. Just how hard the cylinder should be tempered seems to depend upon the kind of steel used.

The cylinders must be hard enough to keep their shape, and yet if tempered too hard they are likely to contain a number of very fine cracks, imperceptible at first, but which will open a little wider with each application of the pressure until the cylinder gives way. The best results were obtained with cylinders made of a special steel which, without much tempering, is hard enough to keep its shape. Most of the cylinders were "built up" of a number of concentric cylinders shrunk together, the object being to make the outer part of the cylinder carry more of the strain than it would if made of one piece.

With cylinders of the dimensions named, reactions have been carried out under a pressure of 200,000 pounds to the square inch, but having forced a cylinder of this size (1¼ inch bore) to such a pressure once, it is by no means safe to conclude that it will stand the same pressure again, for it may burst under a much lower pressure. Even the hard tool steel plugs and pistons have been crushed by such pressures, so it would seem that the limit had been reached, at least for cylinders of this size. If higher pressures are desired, cylinders of smaller bore must be used. A three-fourths inch bore will be found

very convenient for pressures of about 200,000 pounds to the square inch. A one half inch bore is the smallest that has been used by the writer. With cylinders of this size pressures of over 400,000 pounds to the square inch have been obtained, but in such test the tool steel pistons were completely crushed.

The ram *R* of the press must be made of hard steel, and a block *B* of the same material should be embedded in the lower platten of the press. The "four rod, punch-type" hydraulic press, shown in Fig. 3, is a

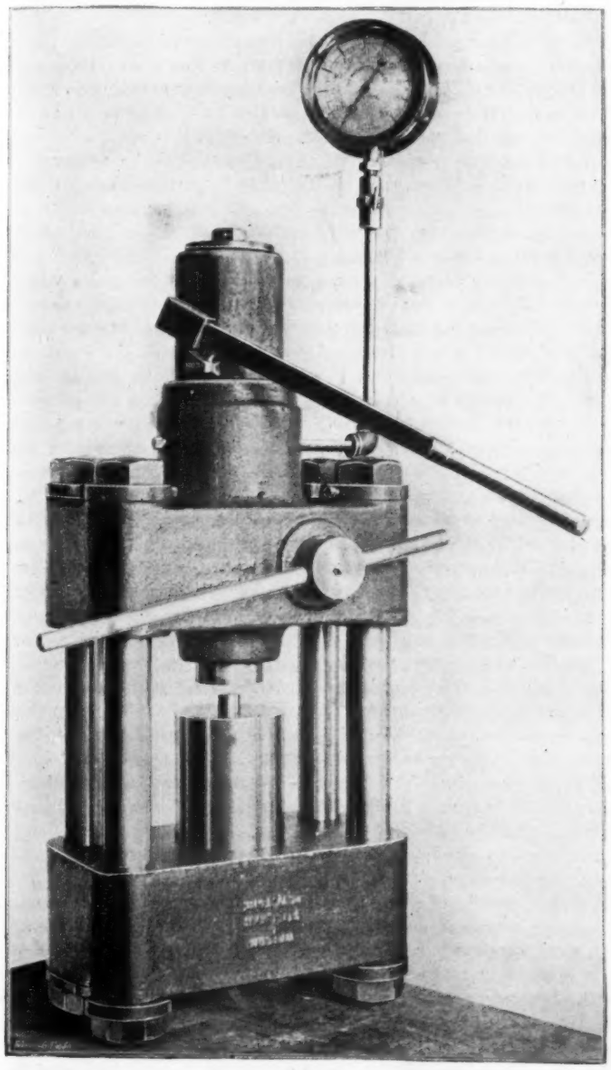


Fig. 3.

very convenient machine with which to apply and measure the pressures. It weighs about 1,000 pounds and has a capacity of considerably more than 100 tons. The pressure is applied and relieved by means of the upper level shown in the cut. The ram is quickly raised or lowered with the lower lever.

It will be observed that there is ample room in this press for inclosing the cylinder within a jacket or bath by means of which the effect of a wide range of temperature may be studied in connection with the pressure, and that the application of each is entirely independent of the other.

A testing machine may be used to furnish and measure the pressure. In order that the method might be applicable to long-continued pressures without being limited to one determination at a time, and without leaving the press so long under a strain, the cylinder shown in Fig. 4 was devised. It is somewhat longer than the one just described, and the bore is abruptly decreased at a point a short distance above the bottom forming a shoulder upon which rests the lower plug *O*. The piston *P* is also provided with a shoulder which enables the pressure (after being applied as before) to be carried by the heavy screw *S*. In order to open this cylinder it will be necessary to put it back into the press and apply enough pressure to the piston to relieve the screw, which is then removed, and the piston, the lead tube, and the plug *O* are pushed out with a steel rod applied through the hole in the bottom of the cylinder. This cylinder has another advantage, especially when a testing machine is used, in that it may be inverted or shaken so as to mix the reagents while they are under pressure. This is desirable in working with reactions which readily take place under ordinary pressures, but which are suspected of taking a different course under higher pressures. In such cases the reaction should not begin until the pressure is applied. Several methods for accomplishing this will suggest themselves; among them the following: The reagents are dissolved in two separate portions of the solvent, the solution of higher specific gravity poured into the platinum tube first, then the other portion is introduced carefully so as not to mix the two. After the pressure is applied and secured by the screw, the cylinder is inverted. This may, however, be accomplished just as easily in the simpler cylinder first described and with the advantage of an unbroken record of the pressure, if the press is supported so that it may be titled. Of course, in working with reactions which do not take place until higher pressures or temperatures than ordinary have been applied, no such precautions will be necessary.

A cylinder that may be very conveniently used in many lines of work is shown in Fig. 5. It is made much lighter than those described and is not intended for pressures of more than about 25 tons per square inch. It will be observed that the pressure may be secured by the screw and so continued indefinitely after removing from the press; also that the lower end of the cylinder is permanently closed. In this cylinder a solid block of lead (indicated in the section by the solid rectangle) serves as the packing. It rests on an offset or shoulder, the

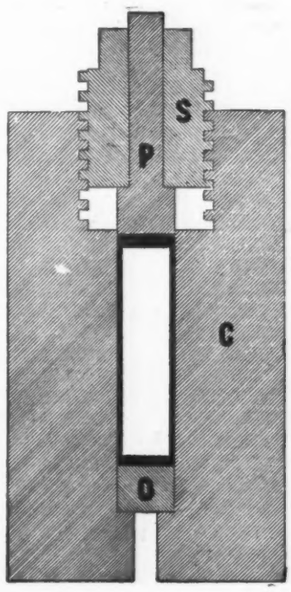


Fig. 4.

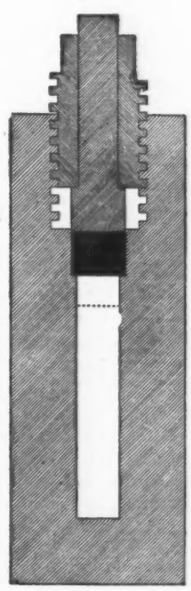


Fig. 5.

space below it being filled with water, and the platinum tube containing the reagents. The piston forces the lead down into the cylinder, compressing the water and preventing its escape. In order to open the cylinder the piston and packing must be pulled out. The piston can be easily removed if fastened in a vise. The packing may be removed by a screw, the head of which is held in a vise. These would not be the comparatively easy operations they are, but for the fact that the water in expanding gives the packing and piston a decided start. One person can open and charge 10 or 12 cylinders in an hour.

A certain amount of pressure is always required to force the lead packing past the shoulder, and in order to measure accurately the net pressure on the water, a hole is drilled through the side of the cylinder, and a piece of tubing leading to a gauge is attached directly. A gauge attached in this way to a cylinder containing a liquid under pressure is exeremely sensitive to changes in temperature, and if a constant pressure is to be maintained *after the cylinders are taken from the press*, the temperature must not change. These low pressure cylinders would certainly be convenient substitutes in many cases for autoclaves or sealed tubes. Of course other metals (or alloys) than lead may be used as packing and other liquids than water may be used to communicate the pressure to the platinum tube and its contents.

The above method was worked out in connection with a study of the

effect of pressure on bacteria in milk, meats, fruit juices, and other perishable food stuffs. At odd moments, while this work was going on, the effect of pressure on a number of chemical reactions received attention, and these will be reported in the near future.

[From *Engineering Record.*]

The Distribution of Electricity in Philadelphia.

The remarkable immunity of Philadelphia from trouble with the electrolysis of underground pipes and cables has so frequently been referred to that it seems desirable to print the regulations of the Electrical Bureau of the Department of Public Safety of that city. These rules and regulations refer to the entire subject of the municipal control of the distribution of electricity, and before giving them a short review may well be made of the portion relating to electrolysis of the report for 1898 of Mr. David R. Walker, who has been the head of the Bureau for 15 years.

He says that during 1898 frequent and exhaustive tests were made of the cables and other structures belonging to the city, and where a positive or faulty condition existed, the railway company was at once notified and the trouble remedied, either by bonding to the trolley return leads or by laying larger returns. Through the constant efforts of the company to remove the cause of complaint from electrolysis due to their escaping currents, they have been put to a large expense in re bounding the joints between the rails with cast weld joints, large gauge bond wires firmly connected under heavy hydraulic pressure, and the use of heavy copper cables across bridges and at intersections where an escape of current was manifest.

On a number of the bridges across the Pennsylvania Avenue Subway, where a 6-inch rail has replaced the 9-inch section formerly used, a ¾-inch solid copper wire has been laid between the tracks, the rails bonded and cross bonded and connected to this wire at every joint, and the wire has been connected in turn to the ends of the 9 inch rail at each end of the bridges. This wire is added to make up the deficiency in carrying capacity between the 6-inch and the 9-inch rails. A heavy cable has also been placed under steam railway crossings where bonds cannot be maintained, and connected to the ends of the 9-inch rails. The company has also provided very heavy return cables to its power houses.

Pole and Wiring Regulations.—No pole or wire will be permitted to be erected over, along or across the highway, without a permit from the Electrical Bureau.

The placing of poles on the highway without having first been inspected by the Electrical Bureau will not be permitted.

Telegraph, telephone, electric light and terminal poles to be of straight, sound chestnut, locust or pine timber, neatly dressed before being erected, and not less than 40 feet in length, 8 inches in diameter at the top, well proportioned ; or of iron, not less than 5 inches in diameter at the top and 8 inches at the surface of the pavement, set 12 inches back from the face of the curb, and not less than 5 feet in the ground, and subject to inspection and approval by the Electrical Bureau before being erected. Upper gain or space on telegraph, telephone and electric light poles to be reserved for city use.

Trolley poles to be not less than 27 feet long, 6 inches in diameter at the top, 8 inches in diameter at the surface of the pavement and not less than 5 feet in the ground.

Location of all poles in the highways, and size and length of poles must be approved by the Electrical Bureau before the street or pavement is broken or pole erected.

All pavements broken for the erection of poles or for the purpose of connecting therewith, must be repaired immediately upon the completion of the work.

Erection of wooden poles in the streets where the footwalk is less than 6 feet in width will not be approved. The erection of poles of a greater diameter than 12 inches at the surface of a footwalk 6 feet in width will not be approved. Footwalk of 8 feet in width, pole not to exceed 14 inches in diameter at the surface of the pavement. Footwalk of 10 feet in width, pole not to exceed 15 inches in diameter at the surface of the pavement. Footwalk of 11 feet in width, pole not to exceed 16 inches in diameter at the surface of the pavement. Footwalk of 15 feet or more in width, pole not to exceed 18 inches in diameter at the surface of the pavement.

Telegraph, telephone and electric light wires to be suspended and maintained not less than 20 feet above the pavement, and not less than 25 feet at all street crossings and intersections.

No telegraph or telephone wire will be permitted to be suspended or maintained through or between electric light wires nor electric light wires be permitted to be suspended or maintained through or between telephone or telegraph wires, unless thoroughly insulated and secured to a proper support on a pole. In all cases telegraph and telephone wires, where they cross electric light wires, must, to prevent accident, be suspended and maintained not less than 4 feet apart.

Electric light wires to be erected and maintained across the street at not less than 4 feet under all telegraph and telephone wires, to prevent accident.

Feed wires, where authorized, shall be suspended and maintained not less than 20 feet above the pavement, and at street crossings or intersections, not less than 25 feet above the street.

Trolley wires shall be suspended not less than 20 feet above the street pavement, and maintained not less than 18 feet above the roadway, and kept thoroughly insulated to prevent current escaping to the poles. At steam railroad crossings said wires are to be suspended and maintained not less than 22 feet above the roadway.

To prevent accident, dead or unsafe wires shall be removed from along or across the highways by the party or parties causing the same to be erected.

In all cases poles to be erected and maintained not less than 4 feet from fire plugs and gas lamps.

Head guys or stay wires must be attached to the poles when the Electrical Bureau deems it necessary for the proper maintenance and safety. Guard wires shall be erected and maintained at such places as shall be directed by the Electrical Bureau.

Poles being removed from the highways shall be dug out and the pavement properly repaired.

To avoid accident or tampering with underground cables, conduits and manholes in the highways, by unauthorized persons, a permit must be obtained from the Electrical Bureau authorizing the opening of manholes for repairs and for the drawing in or out of cables.

Construction of all conduits, manholes and connections thereto must be approved by the Electrical Bureau before being placed in the street.

No permit for terminal poles will be granted unless the same are fed by an underground system, and where surrounding conditions would warrant its use.

No permit for the erection of a terminal pole will be issued for the distribution of telephone wires to a high building or series of connected high buildings. Such buildings will have to be supplied through an underground conduit entering the same.

No permit for the erection of terminal poles will be granted when another device can be better substituted.

Electric Railway Regulations.—Trolley wires to be erected 20 feet above the street pavement except crossing steam railroads, where the clearance shall be 22 feet.

Single trolley must have two guard wires erected 3 feet apart and at an equal distance on either side of the trolley wire.

Guard wire to be of silicon bronze of not less than No. 4 gauge, or other wire of equal tensile strength, joined together with the upper span wire, and insulated from the poles. All joints to be made equal to the wire in current-carrying capacity.

All guard wires to be broken with an insulator at least 10 feet from each side of an intersecting trolley wire, and also insulated from intersecting guard wires.

All pull-off and strain wires to be connected to and insulated from any trolley wire which they may cross.

Span wires to be of greater strength than the guard wires and not less than 12 inches apart ; the span wire carrying the trolley wire to be insulated from the pole at both ends.

Guard, trolley and pull-off wires must be so erected that they will not interfere with the raising and lowering of arms from which electric lamps are suspended for public lighting.

Poles to be of iron erected 10 inches out of plumb and set 6 feet in the ground, and incased with no less than 3 inches of concrete and cement, and 12 inches from face of curb to the face of the pole. Hole to have 6 inches broken stone in the bottom before pole is set,

Poles to be set on the dividing line between properties (unless otherwise directed) if there is no objection to prevent so being placed, and well painted.

Avoid poles being placed in front of doors and windows as much as possible.

No change in the location of the poles will be permitted without the approval of the Electrical Bureau.

The holes wherein poles are to be placed must be filled up within 12 hours after being opened, and pavement restored as soon thereafter as possible.

Locations of the poles and other construction in the highway are subject to change, when it may be deemed necessary by the department.

Conduits must be well ventilated through the poles within every 1,000 feet along the entire length of the conduit.

The rails must be well bonded together, cross bonded and connected at short intervals to a wire of large capacity, which is to return to and be connected with the dynamo.

Conduits, manholes, cables, poles and all materials used in the construction of trolley lines must be approved by the department before being placed in the highway.

Pneumatic Propulsion.

The London *Engineer*, in an article descriptive of some of the early attempts to utilize air for conveying purposes, says:

Prior to the advent of steam worked railways in 1830, in which year the Liverpool and Manchester line was opened, inventors were hard at work in their endeavors to perfect the atmospheric system of railway, as it was then called, and a stimulus was given to their labors by the unfortunate death of Mr. Huskisson—the first railway victim—upon that occasion. One example of the prior application of the atmospheric principle to the propulsion of railway trains was that by John Vallance, of Brighton, in 1827.

It is now nearly two centuries and a half since Papin, in the year 1654, suggested the employment of atmospheric pressure against a vacuum as a motive power. The suggestion, however, does not appear to have been acted upon nor the principle applied to any practical pur pose until it was embodied in Newcomen's engine, which, of course, was not for purposes of locomotion. That application was left for later times to develop; and, according to the *British and Foreign Review* of April, 1844, the idea of applying atmospheric power for the pro pulsion of land carriages first occurred in a definite form in 1805 to Mr. Taylor, of Manchester, the inventor of the first power loom. Although that gentleman conceived the idea, he does not appear to have possessed sufficient ingenuity to carry it out in practice. He, however, submitted the notion to his friends, Duckworth and Clegg, two engineers of the time, and although they were all three of opinion that the idea was capable of realization, they found that the accomplishment of their object was so beset with difficulties that they eventually allowed the matter to drop. Taylor's scheme only extended to the conveyance of letters and dispatches. He suggested that a tube, large enough to contain a parcel, should be laid down from one town to another, a stationary engine being employed at either end to exhaust the tube.

The subject was then taken up by George Medhurst, a London engineer, who, in 1810, published a pamphlet, in which he described "A New Method of Conveying Goods and Letters by Air." Two years later he published his calculations and remarks on the practicability of his scheme. By the year 1827 Medhurst appears to have further developed his ideas, for in a pamphlet which he then published he describes a system in which he employed a tube through which he drove a carriage by air pressure in one direction and drew it by vacuum in the other. A further development of the system was the employment of a tube 24 inches in diameter, within which worked a piston with a piston rod passing upward through a longitudinal channel and connected to a carriage running on rails. The piston was to be driven by air pressure, and the channel was to have a water seal. His third suggestion was a combination of the two methods, goods being conveyed within the tube and passengers in a carriage outside it.

Yet another method proposed by Medhurst was to have an iron air tube of square section, 4 feet in area, fitted with a longitudinal flap valve on the top, through which the arm of the piston projected, and was attached to a carriage running upon the ordinary roadway without any rails. By this modification goods and passengers were to be conveyed "at the rate of a mile a minute, or 60 miles an hour, and without any obstruction, except at times contrary winds, which may retard its progress and heavy snow which may obstruct it." However wild Mr. Medhurst's system may appear, to him must be given the credit of originating the longitudinal valve on the tube, a principle which underlies the inventions of nearly all others who subsequently sought to solve the problem of pneumatic propulsion with external carriages.

Previously to the appearance of Medhurst's last pamphlet, Mr. Vallance had, in 1824, taken out a patent for his system of locomotion by atmospheric pressure. This was only a modification of Medhurst's first suggestion of a tube through which a carriage was to be propelled and drawn alternately by means of a plenum and a vacuum. The working model of this railway, 150 feet in length and 8 feet in diameter, appears to have been the extent of the application of the principle by Mr. Vallance. In 1834 Henry Pinkus appeared upon the scene with a patent for a pneumatic railway, which was on the same principle as Medhurst's fourth modification, with the exception that Pinkus proposed to use a circular insted of a square tube, and to employ a hemp and tallow rope for his continuous valve. The rope valve was to be opened by a small friction roller passing under it, and closed by another passing over it, both being attached to the carriage above it. In practice, however, it was found that on employing a vacuum the rope was forced into the tube by the external pressure of the atmosphere, the vacuum being thus destroyed.

The question now was to devise a valve which should neither be blown out under internal, nor be forced in under external pressure. And here Mr. Clegg took up the running, and in 1839 obtained a patent for a continuous valve having a leather hinge, and working in a trough containing a fatty composition which was solid at the ordinary temperature, but which was easily melted by the application of warmth.

This, of course, involved the heating of the composition in order to seal the valve in the rear of the opener as the carriage passed onward, and this was to be effected by a tubular heater containing burning charcoal. Besides the modification of the valve, Mr. Clegg, in conjunction with Mr. Samuda, improved the armature, which, instead of proceeding, vertically from the piston to the carriage, as in Pinkus's patent, passed through the valve at a very low angle, nearly horizontally, in fact—which caused the valve only to be very slightly opened. The details of the piston were also materially modified by the same inventors, whose names stand out very prominently in the history of the atmospheric railway.

So far the respective inventors only availed themselves mainly of the mechanical properties of the atmosphere resulting from its action on a piston working in a tube and connected, through a continuous valve, with an external carriage. In 1844 James Pilbrow pointed out that the idea did not appear to have occurred to anyone to connect a carriage outside the tube to a piston within it without the use of the continuous valve. He therefore patented a system which consisted of a circular tube having a longitudinal square chamber mounted on the top and opening into it. The piston, which traveled in the tube, was connected by an armature with a tail piece, which traveled in the square chamber above it. This tail piece was a double rack, which, as it passed along, drove pinions fixed at intervals in pairs on either side of it. The spindles of these pinions were continued upward through stuffing boxes, their upper ends carrying pinions gearing into racks attached to the underframing of the first carriage of the train. This system was designed for use either on common roads or on railways. Two other modifications of the continuous valve should have a passing notice. They are those of M. Hallette and Mr. Hay, the former of whom proposed to close the longitudinal aperture of the piston tube by means of two elastic tubes containing water under pressure, the armature of the piston passing between the tubes. Mr. Hay proposed to supersede the hinged valve by one which was free at both edges—a mere strip, in fact, held at the two extremities and passing through a forked armature.

Such are the broad and general principles upon which the construction of the old atmospheric railways was based. These principles were applied in practice to a limited extent only, although, in some instances, with considerable promise of success. In 1840 Clegg and Samuda's system was laid down experimentally on a portion of the West London Railway, at Wormwood Scrubbs. So favorable were the results that the atmospheric system was adopted on the Dalkey extension of the Dublin and Kingstown Railway, and this—the first atmospheric railway—was in full operation at the commencement of 1844. Its satisfactory working is alluded to in the report of the House of Commons Select Committee, to which we have already referred. This success led to the London and Croydon Railway Company, in 1844, laying down a line of atmospheric railway alongside their locomotive line, and, further, to the adoption of this method of working by the South Devon Railway Company on a portion of their line. On the latter lines, however, the principle was soon given up as unsatisfactory. It was likewise ultimately abandoned on the Kingstown and Dalkey line after a trial of several years, when the railway was extended to Wicklow. The results of working in all cases clearly showed that the atmospheric system could not compete with the locomotive with any hope of success. The first cost was favorable, but the expense and extreme care necessary to keep the tube and its accessories in working order killed it. Thus the history of atmospheric railways can only be considered as a chapter of failures.

Later times, however, have witnessed a return to the principle, but worked out under conditions differing widely from those under which it existed in the examples we have mentioned. In the pneumatic sys-

tem, as it was now called in contradistinction to the old title of atmospheric, a tube of large diameter was employed, the carriage itself forming the piston, a useful vacuum being thus obtained. It was, in fact, Mr. Taylor's original proposition, which improved mechanical appliances enabled engineers to work out in practice. About 30 years since the pneumatic system was carried out in various ways. An experimental line of pneumatic dispatch was laid down and worked at Battersea, while later on a shorter pneumatic passenger railway, embodying advances in detail, was constructed and worked for a time at the Crystal Palace. The outcome of the experimental working of these two lines was the construction of a pneumatic dispatch tube by Mr. Ramell in the very heart of London. This tube extended from the General Post Office, St. Martin's-le-Grand, to the London and Northwestern Railway terminus, at Euston Square. There was a central station in Holborn, where was placed the machinery for effecting the transit of the trains of carriers. The air motor consisted of a 22-foot fan, driven by a steam engine having a pair of 24-inch cylinders with a 20 inch stroke. The tube was of a flattened horseshoe section, 5 feet wide and 4 feet 6 inches high at the center, and had a sectional area of 17 square feet. The tube between the General Post Office and Holborn was 1,658 yards in length, or nearly a mile, the length from Holborn to Euston being 3,080 yards, or 1¾ miles. The carriers, which were 10 feet in length, were at the ends of the same sectional area as the tube, and weighed 22 hundredweight each. The trains of carriers were drawn from the Post Office and from Euston by exhaust, and were propelled to those points by pressure. Although the system worked very successfully, and was proved to be well adapted for the safe and rapid transit of mail bags and parcels, neither the Post Office authorities nor the general public availed themselves of its services, and this revival of the atmospheric principle proved a commercial failure, and the pneumatic dispatch fell into desuetude. It was also proposed to work vehicles in the tunnel under the Thames, between Smithfield and the South side, by the pneumatic system, but nothing was done in this direction. So far as we are aware, the only form in which the principle has survived is that employed in connection with the telegraphic department of the Post Office.

Gasfitting Regulations as Adopted Last Month by the Authorities of Brookline, Mass.

According to the action of the authorities of Brookline, Mass., the following regulations are hereafter to prevail in that district in the matters of gasfitting and the materials used therewith :

Section 1. In all cases of repair of leaks, a notice giving the location and extent of all work performed shall be filed with the Inspector of Buildings immediately upon completion of the same.

Sec. 2. No pipe or fitting shall be covered or concealed from view until approved by the gas inspector of the building department, or for 24 hours after notice has been given to the inspector.

Sec. 3. No pipe shall be so laid as to support any weight (except fixtures), or be subjected to any strain.

Sec. 4. All outlets for fixtures shall be securely fastened to the satisfaction of the inspector, all outlets not covered by fixtures shall be left capped, and the number of burners for each outlet shall be marked on the builders' plans.

Sec. 5. Any pipe laid in a cold or damp place shall be properly dripped and protected.

Sec. 6. All swing brackets shall have a globe or guard to prevent its burner from coming in contact with the wall. All bracket outlets shall be at least 9 inches from door or window casings.

Sec. 7. Gas or combination fixtures in all public buildings, theaters and public halls shall be made safe to the satisfaction of the inspector.

Sec. 8. All stop pins to keys or cocks or fixtures shall be screwed into place.

Sec. 9. The use of gasfitters' cement is prohibited, except in putting fixtures together.

Sec. 10. Gas shall not be let on in any building until the work performed has been approved by the inspector. Inside services shall be tested by the fitter who receives the permit to connect the service or meter.

Sec. 11. There shall be a brass straightway valve on the service pipe close to the foundation wall, one at the inlet and one at the outlet side of each meter. Iron valves shall not be used.

Sec. 12. There shall be a final test, by a gasfitter, of all fixtures and pipes by 2 inches of mercury, which must stand five minutes ; this test to be made in the presence of the gas inspector ; the gauge to be made of glass tubing of uniform interior diameter, and so constructed that both surfaces of the mercury will be exposed.

Sec. 13. All gas pipe shall be of wrought iron, all fittings of malleable iron, and all meter connections of lead pipe of the same size as the fit or riser. Galvanized fittings are prohibited.

Sec. 14. Brass solder nipples shall be used on all meter connections.

Sec. 15. No riser shall be left more than 5 feet away from the front foundation wall.

Sec. 16. All buildings shall be piped according to the following scale and properly fastened :

Iron pipe.....	⅜-inch,	26 feet,	3 burners.
"	½ "	30 "	6 "
"	¾ "	50 "	20 "
"	1 "	70 "	35 "
"	1¼ inches,	100 "	60 "
"	1½ "	150 "	100 "
"	2 "	200 "	200 "
"	2½ "	300 "	300 "
"	3 "	450 "	450 "
"	3½ "	500 "	600 "
"	4 "	600 "	750 "

When brass piping is used on the outside of plastering or woodwork, it shall be classed as fixture.

Sec. 17. All outlets and risers shall be left capped or covered with fixtures.

Sec. 18. All service pipes in cold or damp places shall be painted with two coats of read lead and boiled oil.

Sec. 19. Gas outlets for burners shall not be placed under tanks, back of doors, or within 4 feet of any meter.

Sec. 20. All gas burners less than 3 feet from ceiling or woodwork shall be protected by a shield.

Sec. 21. All brass tubing used for arms or stems of fixtures shall be at least No. 18 standard gauge and full size outside so as to cut a full thread. All threads on brass pipe shall screw in at least $\frac{5}{16}$ of an inch. All rope or square tubing shall be brazed or soldered into fittings and distributers, or have a nipple brazed into the tubing.

Sec. 22. All cast fittings such as cocks, sewing joints, double centers and nozzles shall be *extra heavy*. The plugs of all cocks must be ground to a smooth and true surface for their entire length, be free from sand holes, have not less than ¾-inch bearing (except in cases of special design), have two flat sides on the end for the washer, and have two nuts instead of a tail screw.

Sec. 23. Outlets for gas ranges shall have a diameter not less than that required for six burners, and all gas ranges and heaters shall have a straightway valve on the service pipe.

Sec. 24. Pipes in buildings shall be laid above timbers instead of beneath them, where it is possible to do so.

Sec. 25. No second-hand gas pipe shall be put into use in any building without the written permit of the Inspector of Buildings.

Sec. 26. Drops or outlets less than ¾ of an inch in diameter shall not be left more than ¾ of an inch below plastering, center piece or woodwork, and other outlets shall not project more than ¾ of an inch beyond plastering or woodwork.

Sec. 27. Fastening boards shall not be cut away to accommodate electric wires. All outlets shall be fastened to the satisfaction of the inspector.

Sec. 28. All iron pipes used for piping buildings, all arms, and all items of fixtures, shall be of the kind classed as standard pipe, and shall weigh according to the following table :

Size of Pipe.			
⅛-inch.....	.24	pounds	per foot.
¼ "	.42	"	"
⅜ "	.56	"	"
½ "	.85	"	"
¾ "	1.12	"	"
1 "	1.67	"	"
1¼ "	2.24	"	"
1½ "	2.68	"	"
2 "	3.61	"	"
2½ "	5.74	"	"
3 "	7.54	"	"
3½ "	9.00	"	"
4 "	10.66	"	"

Sec. 29. No gas pipe shall be laid in cement, unless the pipe and channel in which it is placed are covered with tar, nor within 6 inches of an electric wire. [This section not adopted.]

Sec. 30. Wherever spark-lighting or self-lighting burners are used the mercury test shall be applied to the cocks.

Sec. 31. Gas pipe on chimney breasts and the like shall be placed back of the studding in all cases.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following correspondence explains itself:

THE DALLAS GAS AND FUEL CO.,
DALLAS, TEXAS, July 17, 1899.

To the Editors AMERICAN GAS LIGHT JOURNAL: Permit me to correct my statements in the discussion[1] of Mr. Paul Doty's paper on "The Causes Underlying the Formation of Naphthalene and Their Prevention." Beginning with the second sentence (par. 2, p. 4, July 3d), the paragraph should read: My experience in a plant where a steam jet exhauster was used showed that there was a copious deposit of naphthalene throughout the entire works, because the temperature of the gas was raised so very high and an immense amount of moisture was placed into the gas by the use of an exhauster. That was a confirmation of Mr. Gimper's theory to my mind. I find also that, with the rotary exhauster, at times an ample supply of liquid is found in the drips, and this is the time I am most apt to find naphthalene deposited about the works; but sometimes the conditions are such that the drips, instead of yielding moisture, will produce nothing for days and actually dry out. At those times we have no naphthalene about the works. I understand that this Botley process is one in which the oil is injected into the gas by *gas* under pressure, and thus the oil is atomized.

Again, fourth sentence, second paragraph: It occurred to me, with this injection of oil into the gas by *gas* under high pressure, that the sudden expansion which the gas will have when that pressure is reduced, will produce a slight but sudden reduction in the temperature of the surrounding gas and at the same time of the introduction of the oil vapor, which acts as a solvent to the naphthalene, allowing moisture to go down while the naphthalene remains in suspension with this vapor.

Since returning home I have found the article I referred to, on page 548 of the December 1st, 1898, issue of the Progressive Age, and it is based on a paper, read November 10th of that year, before the Southern District Association of Gas Engineers and Managers, by Mr. Charles E. Botley, of the Hastings (England) gas works.

Very truly yours, THOS. D. MILLER.

THE Electric Light and Power Company, of Syracuse, N. Y., is extending its present power house, the extension to be 30 feet in width and 100 feet in length. It is to be a one story structure, with brick side walls and steel framework. The framework is arranged to carry two traveling cranes over the dynamos and engines. The Berlin Iron Bridge Company, of East Berlin, Conn., has been awarded the contract to design, furnish and erect the steel work for the named extension.

MESSRS. ARTHUR SEWALL, George Fisher and A. H. Shaw have offered the assignees of the Bath (Me.) Gas and Electric Company, $130,000 in cash, the overdue interest on the Company's first mortgage bonds, and to clear up all indebtedness on local tax account, for a free and clear title to the Company's properties and franchises.

THE proprietors of the New York Suburban Gas Company have notified the residents of New Rochelle, N. Y., that on and after August 1st the selling rate there shall be $1.35 per 1,000 cubic feet, less 10 cents per 1,000 for prompt payment.

A CORRESPONDENT incloses the following, from a recent issue of the Attleboro (Mass.) *Sun:* "At the annual meeting of the Attleboro Gas Light Company the following officers were elected: Directors, George A. Dean, Everett S. Capron, A. W. Sturdy, John R. Bronson, Homer M. Daggett, Jr., Jas. E. Blake and W. J. Luther; President, George A. Dean; Vice-President, Everett S. Capron; Treasurer and Clerk, A. W. Sturdy. The official reports showed that the Company was hard at work putting its plant into condition to supply the increased demand made upon it. It has added materially to the generating division, and is now engaged in the erection of a gasholder which will treble its storage capacity."

MR. N. C. DYE, who has acted as Superintendent of the Rutland (Vt.) Peoples Gas Light Company since 1861, has resigned. His retirement is to date from the 1st prox.

1. *Ante*, p. 2.

THE Quincy (Ills.) Gas Light and Coke Company has certified to an increase of its capital stock from $300,000 to $600,000.

THE Capital City Gas Light Company, of Des Moines, Iowa, has paid into the city treasury the sum of $1,259.18, which represented the city's royalties on account of the gross sales of the Gas Company for the half year ended June 30. The royalty is computed on the basis of 2 per cent. of the gross sales.

MR. H. W. TYLER, Secretary of the Massachusetts Institute of Technology, informs us that the entrance examinations of the Institute have been held this year at the following points: Albany, Buffalo, Manlius, New York and Poughkeepsie, N. Y.; Boston and Springfield, Mass.; Cincinnati and Cleveland, Ohio; Philadelphia and Pittsburg, Pa.; Concord and Exeter, N.H.; Denver, Col.; Detroit, Mich.; Indianapolis, Ind.; Louisville, Ky.; Kansas City and St. Louis, Mo.; Portland, Me.; St. Paul, Minn.; and Washington, D. C. The total registration (633) is 78 more than last year and the largest in the history of the Institute. Of these 261 are preliminary applicants for admission in 1900. A continually increasing proportion of applicants divide their examinations between two successive years. Entrance examinations are also held in Boston in September.

MR. LLOYD TEVIS, one of the founders of the San Francisco (Cal.) Gas Company, and former President of the Wells Fargo Express Company, died at his home in San Francisco, the morning of the 24th inst. Deceased was born in Shelbyville, Ky., March 20, 1824, and after successive business ventures in Louisville and St. Louis, be eventually settled in California in 1849. His estate is valued at $20,000,000.

AT the annual meeting of the Greenfield (Mass.) Gas Light Company the reports showed that the Company had a prosperous year, and that it is entirely out of debt. A dividend of 3 per cent. was declared on the preferred stock, the common coming in for 2½ per cent. The following officers were elected: Directors, J. D. Safford, W. N. Washburn, W. A. Forbes, Dana Malone and W. S. Allen; President, J. D. Safford; Treasurer, A. R. Willard; Clerk, W. S. Allen.

AT the annual meeting of the shareholders in the Lansing (Mich.) Gas Light Company the officers elected were: Directors, B. G. Dawes, B. F. Davis, L. E. Walker, R. G. Spear and T. J. Jones; President and Treasurer, B. G. Dawes; Secretary, L. E. Walker. No dividend was declared as the entire earnings of the Company for the past two years were expended on extensions to the main system, and in betterments to the manufacturing plant. It is the policy of the present management to continue to invest the Company's money in extending its mains wherever the demand is sufficient to warrant the outlay.

THE proprietors of the Aurora (Ills.) Gas Company propose to extend their mains to the neighboring towns of Batavia and Geneva. The extension to the first named place will be made this summer.

PAPERS certifying to the consolidation of the Glens Falls (N. Y.) Gas Light Company and the Glens Falls Electric Light and Power Company, under the title of the Glens Falls Gas and Electric Light Company, with a capital of $250,000, have been filed. The Directors are: Frank S. Butterworth, Walter F. Peacock and Lewis G. Herckenwrath.

LAST Saturday the stockholders of the Waverly (N. Y.) Gas Company voted to increase the capital stock from $50,000 to $150,000.

THE Wright Gas Company, of Lorain, O., because of the improvements just completed under the direction of Superintendent Lomax, is ready for any demand that may be made upon it. We understand that Mr. Lomax soon will leave Lorain to accept a more lucrative position.

THE proprietors of the Tiffin (Ohio) Light and Fuel Company, successors to the ownership of the old natural gas lines of Tiffin, have placed with the Western Gas Construction Company an order for a complete works up to a daily capacity of 250,000 cubic feet, and which will be largely used to supplement the failing supply of natural gas at periods of extreme demand. The apparatus consists of "The Western's" improved Lowe water gas apparatus, of a capacity equal to that named above, together with purifiers, floor carriage and connections complete. The contractors also supply complete working plans of the brick build-

ings required. The plans for the plant also comprise a storage holder equal to retaining 50,000 cubic feet.

MR. P. MEYER, of the Livermore (Cal.) Gas Company, proposes to operate an electric lighting plant in connection with the gas supply.

THE authorities of Paterson, N. J., have contracted with the Paterson and Passaic Gas and Electric Company for the public lighting for a term of 5 years. Under the agreement, gas lamps (not less than 350 in number) are to be paid for at the rate of $18 per post per annum, and arc lights (1,200-candle power) are to cost $107 per annum each.

A CONSOLIDATION of the gas and electric lighting interests of Raleigh, N. C., has been perfected, in the formation of the Standard Gas and Electric Company. The officers of the new concern are: Directors, J. S. Carr, L. A. Carr, B. P. Williamson, H. W. Jackson, J. R. Ferrall and B. S. Jerman; President, B. P. Williamson; Vice-President, Julian S. Carr; Secretary and Treasurer, H. W. Jackson.

ABOUT a fortnight ago the Binghamton (N. Y.) Common Council adopted the following ordinance, the terms of which are completely concurred in by the Binghamton Gas Company:

"*Whereas*, Thefts are frequently committed by persons who obtain access to residences and places of business by claiming to be employees of lighting companies; therefore,

"*Resolved*, That all corporations within the city of Binghamton which have the right to or are in the habit of sending their workmen to make inspections of lighting or water fixtures, or to make repairs thereto, be and they are hereby requested to provide each workman or inspector with a proper badge containing a number and the name of the corporation, and also to provide for each such person a descriptive certificate by which the party presenting the same can be identified by the owner or occupant of the premises visited; and,

"*Resolved*, That all owners or occupants of dwellings within the city be and they are hereby advised to permit no person claiming to represent any lighting, water or other company to enter their premises unless such person shall be in the possession of the aforesaid badge and descriptive certificate."

A CORRESPONDENT in Philadelphia forwards the following: "The Waynesboro (Pa.) gas works have passed into the ownership and control of residents of Waynesboro. The 886 shares held by the George Moyer estate were purchased by a syndicate composed of W. T. Omwake, J. H. Stoner, Dr. J. C. Criswell, T. B. Smith and J. R. Hoeflich, all prominent business men of Waynesboro. There are 1,000 shares of stock of the par value of $25 a share in the Company. The deal was really negotiated prior to Mr. Moyer's death in Philadelphia, but has just been clinched. A new Board of Directors will be elected. The plant, now having a capacity of 36,000 feet, will be doubled. There are $12,000 of 6 per cent. bonds on the plant which will fall due in two years, when they will be refunded at a much lower rate of interest. An effort is also being made by citizens of Waynesboro to get control of the Waynesboro Water Company. The Moyer estate holds 1,919 shares of stock. The capital stock of the Company is $80,000, divided into 2,200 shares of $25 par value each. Only one-half of this amount was actually invested. There are $45,000 of 5 per cent. first mortgage bonds which will be due in two years. These will be refunded at a lower rate. The stock has been paying 5 per cent. dividends."

UNDER date of July 21st the *Commercial Tribune* of Cincinnati had the following respecting the supply of gas to Newport, Ky.:

"The city of Newport will in future be supplied with gas piped over the Licking River from Covington. After several days negotiations between President Shinkle, of the Covington Gas Light Company, and Gus Harms, President of the Newport Light Company, a deal was effected by which Mr. Shinkle has become the owner of the Newport Light Company. The directors of the Newport Light Company have resigned. They are President Harms, Louis Wehr, W. A. Goodwin, W. H. Horton and George Wilshire. Mr. Harms' stock in the Newport Company amounted to $12,000, while that of the other Directors was very small. The stock of the Newport Company, it is understood, was bought at 1½ per cent. A contract with the Cincinnati Gas Company to supply Newport with gas runs until 1907. The price paid the Cincinnati Gas Company by the Newport Company is 75 cents per 1,000 feet, wholesale, the figure at which Mr. Hickenlooper has offered to furnish it to private consumers in Cincinnati. It is stated that the deal will reduce the price of gas to private consumers in Newport considerably. The price now paid in that city is $1.60. Pipes are now being laid from the Covington gas plant to and over the 11th street bridge across the Licking river to Newport, thence to the old gasholder in that city at the foot of 7th street. It holds 125,000 cubic feet and from this Newport will be supplied. The contract between the city of Newport and the Newport Light Company was entered into June 3, 1880, and it gave the Company a 25-year franchise, with the price of gas at $1.75 per 1,000 for the lighting of the city and to private consumers. The price was reduced a few years later to $1.60. In 1891, when the Suburban Electric Company entered the city Newport gave the Gas Company $21,500 for release from contract, so far as lighting the streets was concerned, but the Gas Company continued to furnish private consumers up to the present time. The Newport people are clamoring after cheaper gas and will in all probability secure it, as they have the Gas Company in a very embarassing position. A few days ago the Gas Company applied to City Engineer Glazier, of Newport, to lay a main up Park avenue to 9th and down that street to the old abandoned gasholder. The Engineer, while having no authority to issue a permit, thought it a minor affair and told them to go ahead. An extra large force of men was put to work and they tore up six squares in two days. The property owners along Park avenue made a vigorous protest, but the city officials all held that they had the right if Glazier had given them a permit. The matter was brought before the Newport Council last night and City Attorney Root said that according to law Glazier had no authority to issue a permit. The way to secure cheaper gas was then discussed, but no definite action taken. City Attorney Root was seen later and to a *Commercial Tribune* reporter said: 'I will secure an injunction this morning preventing them from continuing the work of laying their pipe on Park avenue. The citizens of this city have been paying an exhorbitant price for gas and I intend doing all in my power to get the price reduced.' Mayor Biltz was then seen and said: 'I have been under the impression that according to the franchise of the Newport Light Company they have the right to lay mains on all streets. I will, however, investigate the matter in the morning, and if I find out they have not I will see that the work is stopped immediately. I am for cheaper gas, and will do all I can to secure it.' The question of cheaper gas was the sole topic on the streets last night. A report was current that the Cincinnati Gas Company was in the deal and was going to supply gas to both Newport and Covington, but this was denied by Vice-President Norman G. Kenan, who said that the only interest the Cincinnati Company has is a contract with the Newport Company to furnish gas for that city. This contract has considerable time to run and the Cincinnati Gas Company's only concern is whether or not Mr. Shinkle will continue to take gas from the Cincinnati Company or supply it from his Covington plant."

Annual Report of the Commissioner of Patents.

The *Sci. Am.* says that the Annual Report of the Commissioner of Patents cannot fail to produce general satisfaction, particularly when it is learned that some greatly needed reforms in the matter of the system of classification, which has been urged both by former Commissioners and the present incumbent of the office, have been at last carried out. This work is spoken of by Commissioner Duell as "the most notable advance of the year in the work of the office"

"The crying need of this bureau," says the Commissioner, "is for more room." This has been the plea of successive Commissioners for several years, and it is one which this journal has persistently urged on behalf of the vast commercial interests which have their root in the United States Patent Office. The building which was erected for and named after this bureau has been given up largely to the accommodation of the General Land Office, with the result that the overcrowding of the Patent Office has become notorious. The request of the Commissioner that "when the General Land Office vacates the Patent Office building," the Secretary of the Interior "will assign rooms sufficient for the needs of the bureau," finds emphasis in the vexatious delay to which the patrons of the Patent Office have so long been needlessly exposed.

Another crying defect in the accommodations of this bureau is that the priceless records of the office are stored in rooms which are in no sense fireproof—a fact which, if it were not so widely known, would at this late day seem almost incredible. The public will fully indorse the

(*Continued on page* 175.)

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

Notification Respecting Advertising.—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, JULY 31, 1899.

(*Continued from page* 174.)

Commissioner when he says: "In view of the fact that millions of dollars of property would be jeopardized by the destruction of our assignment records—many of the original assignments having been lost by their owners, who depend upon duly certified copies—and in view of the fact that many of our other records are largely of a nature that money could not replace, I believe that a fireproof structure should be provided in which to store them."

The summary of the operations for the fiscal year shows that 41,930 applications and caveats were received, and that the patents granted and trademarks, labels and prints registered numbered 25,404. The number of patents that expired was 16,670. The total receipts of the office were $1,209,554.88; the total expenditures were $1,148,663.48, the surplus turned into the Treasury being $60,891.40. A comparative statement of receipts and expenditures for the past decade shows that the total receipts were $12,700,977 and the total expenditures $10,971,338, making a total surplus of $1,729,637 in 10 years.

A significant indorsement of the valuable work done in the new classification, to which reference has been made above, is found in the table showing the number of applications awaiting action on the part of the office in each year of the past decade. Commencing with 6,585 cases in 1890, the total rose to 9,447 in 1892 and then fell to 4,927 in 1895. It had doubled in the following year, and rose to over 12,000 in 1897 and 1898. By June 30 of this year, thanks to the working of the new system and an increase of the force of examiners, backed by a more liberal appropriation, the number of applications awaiting action had fallen to 2,989—a decrease of over 75 per cent.

As the result of the Spanish war the total number of applications, which in 1898 had risen to 47,747, fell in 1899 to 40,320, the smallest record for the decade being 39,206 in 1894. The present indications, however, show a steady increase in the business of the bureau.

Removing Lead from Pipe Joints.

"Municipal Engineering," in a recent issue, replying to a correspondent who asked for a method of removing lead from pipe joints, in the instance of pipe that was taken up for relaying elsewhere, said that the last annual report of the City Engineer, of Providence, R. I., gave two illustrations of an apparatus used in melting the lead out of the joints of some 24-inch cast iron mains. A "Wells" light was used, burning kerosene oil under a pressure of about 25 pounds per square inch of compressed air. An iron hood was used to concentrate the heat and a screen when the wind was strong. Each joint was melted out in about an hour, using about two gallons of oil. A 6 inch pipe would take less time and oil almost in proportion to the lead in the joint. A smaller "blower," using kerosene, or gasoline perhaps without the air pressure, could be used on small pipe to better advantage.

The Electrolysis Problem.

Engineering News says that a possible aid in the solution of the electrolysis problem is suggested by the experience of St. John, N. B., with wooden pipe joints in place of lead. In 1851 the city laid a 12-inch, and in 1857 a 24-inch water supply main, some miles in length. Instead of running the joints with lead and calking them, pine plugs were exployed. Within the past two years this practice has been repeated on another 24-inch supply main, and on some smaller branches. The object both in the 50's and now seems to have been wholly the saving of expense. The material for the work recently done is supplied by a local woodworking concern for only 13 cents per joint for the 24 inch pipe, and the cost of labor was only 57 cents more, making 70 cents in all, for lowering the pipe into the trench and calking the joint. The recent work was done by Mr. Wm. Murdoch, Engineer and Superintendent of the Water and Sewer Department of St. John.

The Market for Gas Securities.

Dullness and uncertainty were the prevalent features in last week's trading in city gas shares, although a spurt in Consolidated, solely chargeable to speculative trading, was brought off last Tuesday. The opening price to day (Friday) was 175½, and at noon sales had been reported at a shade over 176. The talk of the week included gossip to the effect that some of the non-executive shareholders in Consolidated, and in two of the other Companies as well, proposed to bring an action to determine whether the Directors were justified in selling gas at prices that must be productive of loss. In our belief this "gossip" comes pretty near to reality. The course of New Amsterdam securities was quite erratic, especially in the matter of the bonds, which were quoted at one time below par. Mutual shows no change, and Standards remain as before.

Brooklyn Union is dull and lower, although the change is but slight. If the warfare in the Manhattan district continues much longer, Brooklyn Union cannot fail to be unfavorably and permanently affected. Bay State is under the $2 mark. Peoples, of Chicago, goes along smoothly, with every indication that it will speedily sell at 125. Cincinnati is slowly returning to its normal value, and Washington (D. C.) gas is pretty close to the late syndicate's bid for it.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JULY 31.

☞ All communications will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	178	178¼
Central Union, Bonds, 5's.	3,000,000	1,000	107⅛	108½
Equitable Bonds, 6's	1,000,000	1,000	105	.
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	.	108	112
Mutual	3,500,000	100	260	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	31½	32
Preferred	10,000,000	100	57½	58½
Bonds, 5's	11,000,000	1,000	100½	101
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	.	112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	112	..
Preferred	5,000,000	100	135	138
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	140	..
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1⅝	1⅞
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	40	..
" 1st Mtg. 5's	450,000	1,000	95	98
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	8¾	9½
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	70	75
1st Mortgage	1,207,000	1,000	106	108
Consumers. Jersey City	2,000,000	100	95	.
" Bonds	600,090	1,000	107⅛	110
Cincinnati G. & C. Co.	8,500,000	100	182	183
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Consolidated, Baltimore	11,000,000	100	61¾	62¼
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	380,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	65	65¼
" Prior Lien 5's	4,546,000	1,000	94¼	94½
Detroit Gas Co., 5's	423,000	1,000	95½	96
" Inc. 5's	31,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	.
Hartford	750,000	25	..	220
Indianapolis	2,000,000	..	122	128
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co.	250,000	50	50	..
" 1st Mtg. 5's	250,000	1,000	96	100
Jersey City	750,000	20	225	275
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	108

Laclede, St. Louis	7,500,000	100	56¾	57¼
Preferred	2,500,000	100	98	100
Bonds	10,000,000	1,000	107	108
Madison Gas & Elec. Co.	400,000	100	82	85
" 1st Mtg. 6's	350,000	1,000	102	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53½	55
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	119	119⅛
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111½	112
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	215	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	70	73
St. Paul Gas Light Co	1,500,000	100	50	52
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96	99
Syracuse, N. Y.	1,750,000	100	16	19
Bonds	1,612 000	1,000	81	84
Washington, D. C	2,600,000	20	260	265
First mortgage 6's	600,000		..	..
Western, Milwaukee	4,000,000	100	99	100
Bonds, 5's	3,830,500	.	106	108
Wilmington, Del.	600,000		214	..

Advertisers' Index.

GAS ENGINEERS.

Page

Wm. Henry White, New York City ... 195
Fred. Bredel, Milwaukee, Wis. ... 182
Geo. R. Rowland, New York City ... 179
The Western Gas Construction Co., Fort Wayne, Ind. ... 200
Humphreys & Glasgow, New York City ... 180
American Gas Co., Phila., Pa. ... 182
David Leavitt Hough, New York City ... 192
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 179
Baxter & Young, Detroit, Mich. ... 192
United Gas Improvement Co., Phila., Pa ... 187
James T. Lynn, Detroit, Mich. ... 192
A. E. Boardman, Brevard, N. C. ... 192
Gilbert & Barker Mfg. Co., New York City ... 178

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City ... 196
Continental Iron Works, Brooklyn, N. Y. ... 194
Deily & Fowler, Phila., Pa. ... 196
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 192
Stacey Mfg. Co., Cincinnati, Ohio ... 195
Bartlett, Hayward & Co., Baltimore, Md. ... 193
Davis and Farnum Mfg. Co., Waltham, Mass. ... 192
R. D. Wood & Co., Phila., Pa. ... 194
Isbell-Porter Company, New York City ... 194
Fred. Bredel, Milwaukee, Wis. ... 182
United Gas Improvement Co., Phila., Pa. ... 187
National Gas and Water Co., Chicago, Ills. ... 189
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 179
The Western Gas Construction Co., Fort Wayne, Ind. ... 200
Humphreys & Glasgow, New York City ... 180
American Gas Co., Phila., Pa. ... 182
Logan Iron Works, Brooklyn, N. Y. ... 196
Riter-Conley Mfg. Co., Pittsburgh, Pa. ... 195
Baxter & Young, Detroit, Mich. ... 192
Berlin Iron Bridge Co., East Berlin, Conn ... 181
G. Shepard Page's Sons, New York City ... 193
James T. Lynn, Detroit, Mich. ... 192
A. E. Boardman, Brevard, N. C. ... 192
Gilbert & Barker Mfg. Co., New York City ... 178
Sutherland Construction & Improvement Co., N.Y. City 178

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md. ... 193
United Gas Improvement Co., Phila., Pa. ... 187
Burdett Loomis, Hartford, Conn. ... 194
National Gas and Water Co., Chicago, Ills. ... 189
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 179
The Western Gas Construction Co., Fort Wayne, Ind. ... 200
Humphreys & Glasgow, New York City ... 180
Gilbert & Barker Mfg. Co., New York City ... 178
Sutherland Construction & Improvement Co., N.Y. City 178

SCRUBBERS AND CONDENSERS.

R. D. Wood & Co., Phila., Pa. ... 194
James R. Floyd's Sons, New York City ... 196
Continental Iron Works, Brooklyn, N. Y. ... 194
Logan Iron Works, Brooklyn, N. Y. ... 196
Riter-Conley Mfg. Co., Pittsburgh, Pa. ... 195

TAR AND CARBONIC ACID EXTRACTOR.

R. D. Wood & Co., Phila., Pa. ... 194

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich. ... 177
American Gas Company, Phila., Pa. ... 182

GAS METERS.

John J. Griffin & Co., Phila., Pa. ... 160
American Meter Co., New York and Philadelphia ... 199
Helme & McIlhenny, Phila., Pa. ... 199
D. McDonald & Co., Albany, N.Y. ... 197
Nathaniel Tufts Meter Co., Boston, Mass. ... 198
Maryland Meter and Mfg. Co., Baltimore, Md. ... 198
Metric Metal Co., Erie, Pa ... 199
Keystone Meter Co., Royersford, Pa. ... 198
Detroit Meter Company, Detroit, Mich. ... 199

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia ... 199
John J. Griffin & Co., Phila., Pa. ... 160
D. McDonald & Co., Albany, N. Y. ... 197
Helme & McIlhenny, Phila., Pa. ... 199
Nathaniel Tufts Meter Co., Boston, Mass. ... 198

GAS AND WATER PIPES.

M. J. Drummond & Co., New York City ... 197
R. D. Wood & Co., Phila., Pa. ... 194
Warren Foundry and Machine Co., New York City ... 197
Donaldson Iron Co., Emaus, Pa. ... 197
Utica Pipe Foundry Co., Utica, N. Y. ... 197

PIPE CUTTERS.

The Anderson Pipe Cutter Co., East Boston, Mass. ... 179

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N. Y. City ... 179

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y. ... 189

GAS COALS.

Penn Gas Coal Co., Phila., Pa. ... 191
Perkins & Co., New York City ... 190
Despard Gas Coal Co., Baltimore, Md. ... 191
Westmoreland Coal Co., Phila., Pa. ... 191
Berwind-White Coal Mining Co., New York and Phila. ... 190

CANNEL COALS.

Perkins & Co., New York City ... 190
Greasy Creek Cannel Coal and Tramway Co., Chicago ... 177

CONVEYORS.

The Link-Belt Machinery Co., Chicago, Ills ... 177

GAS ENRICHERS.

Standard Oil Co., New York City ... 191
The Sun Oil Co., Pittsburgh, Pa. ... 191

COKE CRUSHER.

C. M. Keller, Columbus, Ind. ... 191

GAS GAUGES.

The Bristol Co., Waterbury, Conn. ... 180

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 189
Isbell-Porter Co., New York City ... 194
R. D. Wood & Co., Phila., Pa. ... 194
Wm M. Crane Co., New York City ... 180

CEMENTS.

C. L. Gerould, Galesburg, Ills ... 188

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J. ... 188
B. Kreischer & Sons, New York City ... 188
Adam Weber, New York City ... 188
Laclede Firebrick Mfg. Co., St. Louis, Mo. ... 188
Cyrus Borgner, Phila., Pa. ... 188
James Gardner, Jr., Pittsburgh, Pa. ... 188
Henry Maurer & Son, New York City ... 188
Baltimore Retort and Firebrick Co., Baltimore, Md. ... 188
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. ... 188
Brooklyn Firebrick Works, Brooklyn, N. Y. ... 188

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md. ... 193
Fred. Bredel, Milwaukee, Wis. ... 182
J. H. Gautier & Co., Jersey City, N. J. ... 188
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. ... 188
Adam Weber New York City ... 188

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City ... 194
Continental Iron Works, Brooklyn, N.Y. ... 194
Logan Iron Works, Brooklyn, N. Y. ... 196
R. D. Wood & Co., Phila., Pa. ... 194

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa. ... 186

BURNERS.

C. A. Gefrorer, Phila., Pa. ... 194
Wm. M. Crane Co., New York City ... 177
D. M. Steward Mfg. Co., Chattanooga, Tenn. ... 179

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn. ... 179

STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila. ... 184
Thos. T. W. Miner, New York City ... 179

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 189
van Baarda & Co., Dusseldorf-on-the-Rhine ... 189

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y. ... 180
Chapman Valve Manufacturing Co., Boston, Mass. ... 180
R. D. Wood & Co., Phila., Pa. ... 194
Continental Iron Works, Brooklyn, N. Y. ... 194
The P. H. & F. M. Roots Co., Connersville, Ind. ... 183
Isbell-Porter Co., New York City ... 194
The Western Gas Construction Co., Fort Wayne Ind. ... 200

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind. ... 183
Isbell-Porter Company, New York City ... 194
Connelly Iron Sponge and Governor Co., New York City 189

ELECTRICAL APPARATUS.

Wm. Henry White, New York City ... 195

GAS ENGINES.

Backus Water Motor Co., Newark, N. J. ... 187

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City ... 179

PURIFIER SCREENS.

John Cabot, New York City ... 180

GAS STOVES.

American Meter Co., New York and Philadelphia ... 185
Maryland Meter and Manufacturing Co., Baltimore, Md. 198
Keystone Meter Co., Royersford, Pa. ... 198
Wm. M. Crane Co., New York City ... 180
Nathaniel Tufts Meter Co., Boston, Mass. ... 198

HOT WATER HEATERS.

J. P. B. Sadtler & Co., Baltimore, Md. ... 178
Wm. M. Crane Co., New York City ... 180

GASHOLDER TANKS.

J P. Whittier, Brooklyn, N. Y. ... 180

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md. ... 193
Continental Iron Works, Brooklyn, N. Y. ... 194
Deily & Fowler, Philadelphia, Pa. ... 196
Davis & Farnum Mfg. Co., Waltham, Mass. ... 192
Kerr Murray Mfg. Co., Fort Wayne, Ind. ... 192
Stacey Mfg. Co., Cincinnati, Ohio ... 195
R. D. Wood & Co., Philadelphia, Pa. ... 194
Logan Iron Works, Brooklyn, N. Y. ... 196
Riter-Conley Mfg. Co., Pittsburgh, Pa. ... 195

CHEMICALS.

Emken Chemical Co., New York City ... 177

GAS SECURITIES.

Henry Marquand & Co., New York City ... 177

PATENTS.

H. S. Thornberry, Washington, D. C. ... 197

ADVERTISING.

J. Howland Harding, New York City ... 97

BOOKS, ETC.

Newbigging's Handbook ... 184
Scientific Books ... 191
Digest of Gas Cases ... 191
Practical Photometry ... 188
Gas Flow Computers ... 191
Hughes' "Gas Works" ... 189
Gas Engineer's Pocket-Book ... 177
Excerpts from Reports of Gas Commissioners ... 98
Poole on Fuels ... 189
Binders ... 197
Directory of Gas Companies ... 195
Practical Handbook on Gas Engines ... 184
Coal Tar Tree ... 177

Position Wanted

As Gas Maker in Water Gas Plant or as Manager of Either Coal or Water Gas Works,

by a strictly sober man 37 years of age, and who has had 15 years' experience. Address

1259-2 "P. O.," care this Journal.

Position Wanted.

Thoroughly Competent and Up-to-Date Gas Engineer

desires position as Superintendent or Manager of a Gas Plant Best of references. Address

1238-tf "A. Z.," care this Journal

SECOND-HAND APPARATUS.

I am in position to offer at attractive prices, a considerable quantity of good, usable second-hand Gas Apparatus, of various kinds and sizes, such as Purifiers, Station Meters, Exhausters, Scrubbers and Condensers, Bench Ironwork, Water Gas Machinery, Tanks, etc., etc. Gas Companies or Contractors who can use such will find it worth while to write for prices, stating their requirements. Gas Companies having apparatus to dispose of are invited to communicate upon the matter. F. H. SHELTON,

315 Fidelity Building, 112 N. Broad St., Phila.

HENRY MARQUAND & CO.,

BANKERS

AND

BROKERS.

160 Broadway, New York City.

Utilize Your Gas Liquor.

NO EXTRA LABOR OR OPERATING EXPENSES.

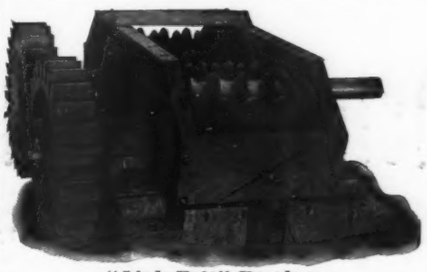
Ammonia Concentrator.

Not Expensive. Write to

STROH & OSIUS, Pat'ees. or

Mich. Ammonia Works, Detroit, Mich.

THE LINK-BELT MACHINERY CO.,



"Link-Belt" Breaker.

ENGINEERS, FOUNDERS, MACHINISTS,

Chicago, U. S. A.

LINK-BELT ELEVATING & CONVEYING MACHINERY for HANDLING COAL, COKE, OXIDE, ETC.

Tilting Coal and Coke Cars, Breaker Rolls, Shaking Screens, Power Transmitting Machinery.

Machinery designed and erected to suit existing conditions and available space.

CATALOGUE UPON APPLICATION.

KENTUCKY CANNEL COAL, FOR GAS AND DOMESTIC USE.

GEO. R. HISLOP, F.C.S., F.R.S.S.A., Gas Engineer of Paisley, Scotland, says in his analysis: "This is a remarkably rich Cannel Coal, yielding illuminating matter per ton equivalent to 1,945 lbs. of sperm candles.' This coal mined and shipped in box cars. Write for sample car and delivered price.

The Greasy Creek Cannel Coal and Tramway Co.,

163 W. Washington Street, - - - Chicago, Ills.

Emken Chemical Co.,

175 South Street, New York City. Works, Long Island City, N. Y.

MINERS OF MONAZITE AND MANUFACTURERS OF

THORIUM AND CERIUM NITRATE.

ALSO MANUFACTURERS OF

INCANDESCENCE FLUID

For Making Non-Shrinking Mantles of Highest Luminosity

Bray's Patent Gas Burners

Are universally used and recommended by leading Gas Companies of the world.

Every Burner stamped with name and Trade Mark. Take no imitations.

Made for high and low pressure. Send for description and prices, also for

ACETYLENE BURNERS.

We are Sole Agents for the United States.

WILLIAM M. CRANE COMPANY,

Nos. 1181 and 1188 Broadway, New York City.

With Bray Burner.

THE GAS ENGINEER'S POCKET-BOOK.

By HENRY O'CONNOR.

Comprising Tables, Notes and Memoranda relating to the Manufacture, Distribution and Use of Coal Gas, and the Construction of Gas Works.

Price, - - $3.50.

A. M. CALLENDER & COMPANY, No. 32 Pine Street, N. Y. City.

Coal Tar Genealogical Tree

MR. T. VINER CLARKE, of London, Eng., having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

In the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

Sutherland Construction & Improvement Co.

Offices: 15 WALL ST., NEW YORK, and OSHKOSH, WISCONSIN.

Owners of the "SUTHERLAND" Patents for Water Gas Apparatus.

Gas, Electric Light, Water Works, and Electric Street Railways Built, Remodeled, Operated, Bought and Sold.

CORRESPONDENCE SOLICITED.

MOUNT HOLYOKE COLLEGE,

South Hadley, Mass.,

A. L. WILLISTON, Treasurer.

NORTHAMPTON, MASS., July 1st, 1899

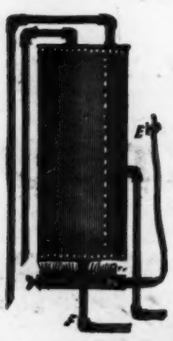
GILBERT & BARKER MANUFACTURING COMPANY:

Gentlemen—The 1,000-light Springfield Gas Machine which you furnished Mount Holyoke College in 1897, lighting six new dormitories, Mary Lyon Hall, the Library and other buildings, has been in use for two full College years, and is giving very good satisfaction.

With your Automatic Mixing Regulator and Welsbach Burners, the quality of the light is good and well adapted to all the various purposes of the Institution, and I am pleased to be able to so report to you.

Yours very truly, A. L. WILLISTON, Treasurer.

An Economical Hot Water Heater.



PERFECT COMBUSTION. NO SMOKE. NO ODOR.

FULLY GUARANTEED.

Will heat the Water in a Boiler in less than half the time required by a Range, and at less than half the expense. Nothing to get out of order, and will last a lifetime.

BUFFALO CITY GAS CO., BUFFALO, N.Y., April 1, 1899.
J. P. B. SADTLER & Co., 813 S. Howard St., Baltimore, Md.
Gentlemen—Replying to your favor of the 30th of March. The Heller Heaters that you have already furnished seem to be large enough, and we will not at present care to use any of the larger size that you mention. We have had no complaint in regard to the Heller Heater that we have used in Buffalo, and so far they are giving us good satisfaction.
Yours very truly, E. H. JENKINS, Engineer.

BALTIMORE, MD., March 24, 1899.
J. P. B. SADTLER & Co., 813 S. Howard St., Baltimore, Md.
Gentlemen—A test of the Heller Water Heater witnessed by me March 21, 1899, showed that with a consumption of 30 feet of gas per hour, the water in a 28 gallon galvanized boiler could be heated from 59° to 102°, or 43° in one hour. Temperature of room at time of test 64°.
Respecfully,
GEO. BEADENKOPP, Ass't Engineer, Con. Gas Co

Clamp Heater to Pipe about 4 Inches away from bottom of Boiler. Always use an independent connection, or regular Gas Stove connection, so as to get a good flow of Gas.

J. P. B. SADTLER & CO., 813 South Howard Street, Baltimore, Md.

W. H. PEARSON, Prest. W. H. PEARSON, Jr., Vice-President. J. T. WESTCOTT, M.E., Manager. L. L. MERRIFIELD, M.Inst.M.E., Chief Engineer.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LD.

American Offices: 269 FRONT STREET, EAST, TORONTO, ONT.
London Offices: 19 ABINGDON STREET, WESTMINSTER, S.W.

Telegraphic Address: "CARBURETED LONDON AND TORONTO."

The above Company have erected since 1893, or are now erecting, their universal type of Carbureted Water Gas Plants at the following Gas Works:

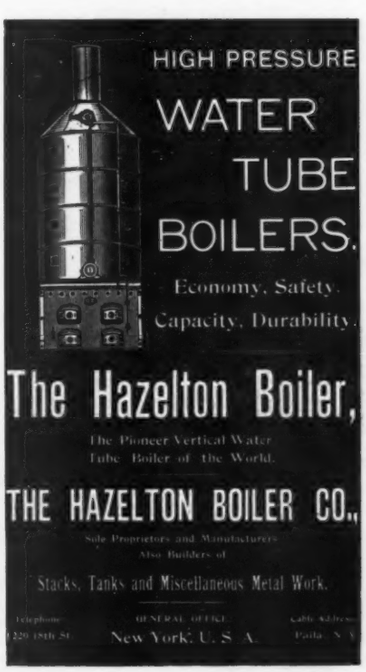
	Cubic Feet Daily.
Blackburn, Eng.	1,250,000
Windsor Street Works, Birmingham, Eng.	2,000,000
Saltley Works, Birmingham, Eng.	2,000,000
Colchester, Eng.	300,000
Birkenhead, Eng.	2,250,000
Swindon (New Swindon Gas Co.), Eng.	120,000
Saltley Works, Birmingham, Eng. (2d Contract)	2,000,000
Windsor St. W'ks, Birming'm, Eng. (2d Contract)	2,000,000
Halifax, Eng.	1,000,000
Toronto,	250,000
Ottawa,	250,000
Toronto (Second Contract, Remodeled),	2,000,000
Lindsay (Remodeled),	125,000
Belleville,	250,000
Ottawa (Second Contract),	250,000
Brantford (Remodeled)	200,000
St. Catherine's (Remodeled),	250,000
Kingston, Pa.	125,000
Montreal,	500,000
Peterborough, Ont.	250,000
Wilkesbarre, Pa.	750,000
St. Catherine's (Second Contract),	250,000
Buffalo, N. Y.	2,000,000
Winnipeg, Man.	500,000
Colchester, Eng. (Second Contract),	300,000
York, Eng.	750,000
Rochester, Eng.	500,000
Kingston, Ont.	300,000
Crystal Palace District, Eng.	2,000,000
Duluth, Minn.	300,000
Caterham, Eng.	150,000
Enschede, Holland,	150,000
Leicester, Eng.	2,000,000

"THE MINER"
Globe
Street and Boulevard
Lamps.
Cheapest and Best.
THOUSANDS IN USE WITH INCANDESCENT BURNERS.
Send for Catalogues.
THOMAS T. W. MINER,
821-823 Eagle Av., N. Y.

SAFETY GAS MAIN STOPPER Co.
211-E. 116 TH ST. N.Y.

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS

GEORGE R. ROWLAND.
Formerly with the Continental Iron Works.
Draughtsman and Constructing Engineer.
Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.
Office, No. 245 Broadway, N. Y. City.



For Sale.
A Small Gas and Electric Light Plant,
in a Southern city of 3,800 inhabitants.
Address FORT WAYNE ELECTRIC CORPORATION,
1097-tf Fort Wayne, Ind.

STEWARD'S BURNERS.

NONE BETTER MADE.
America's Standard Burner.
ARE YOU USING THEM?
The D. M. Steward Mfg. Co.,
N. . Office, 107 CHAMBERS ST.,
CHATTANOOGA, Tenn.

THE ANDERSON Patent Cutter Carrying Link
Made in all sizes.

Will cut from 2 in. to 24 in.
Pipe Cutting Tool
For Cutting Cast, Wrought Iron, Gas & Water Pipes.
THE ANDERSON PIPE CUTTER COMPANY, Manufacturers,
163 Liverpool st., E. Boston, Mass
N. Y. Office, 135 Greenwich St.
C. H. TUCKER, Jr., Manager.
WALDO BROS.,
102 Milk Street, Boston, Mass.

GAS APPLIANCES FOR EVERY PURPOSE.

GAS RANGES,
GAS SOLDERING STOVES,
GAS STEAM TABLES,
GAS CREMATORIES,
BRAY BURNERS,
GAS BURNERS,
GAS SIGNS,
SELF-LIGHTING BURNERS,
BY-PASSES,
GAS FITTINGS,
METER COCKS,
SERVICE COCKS,
WAX TAPERS,
GOOSE NECKS,
SOCKETS,
TUBING, ETC.,
GRAY IRON CASTINGS.

GAS WATER HEATERS,
GAS KILNS,
GAS LAUNDRY STOVES,
GAS OVENS,
GAS PLATE WARMERS,
GAS OYSTER STEWERS,
GAS CONTROLLERS,
GAS BROILERS,
GAS HEATING STOVES,
GAS FIRES,
GAS RADIATORS,
GAS LOGS,
GAS CANDY STOVES,
GAS GRIDDLES,
GAS FURNACES,
GAS IRONS,
GAS TIPS,

THE NEW VULCAN GAS RANGE.

Sizes, 16 and 18-inch Ovens.

WILLIAM M. CRANE COMPANY,

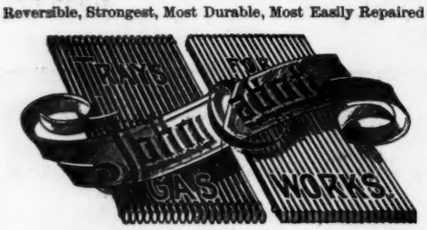
FOUNDRY: Peekskill, N.Y. Office and Showrooms: 1131 and 1133 Broadway. FACTORY: 447-453 W. 14th St.

Send for 1899 Catalogue. Sole Agents for BRAY BURNERS for U. S. A.

Special Trays for Iron Sponge or Oxide of Iron,

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired



553-557 West Thirty-third Street, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

Send for Circulars.

ALEX. C. HUMPHREYS, M. E., M. Inst. C. E. ARTHUR G. GLASGOW, M. E., M. Inst. C. E.

HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG., 31 Nassau Street, New York.

9 VICTORIA STREET London, S. W., England.

CONSULTING GAS ENGINEERS AND MANAGERS.
GAS PROPERTIES PURCHASED.

Bristol's Recording

PRESSURE GAUGE.

For continuous records of Street Gas Pressure. Simple in construction, accurate in operation, and low in price.

Fully Guaranteed. Send for Circulars

THE BRISTOL CO.,

Waterbury, Conn.

CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

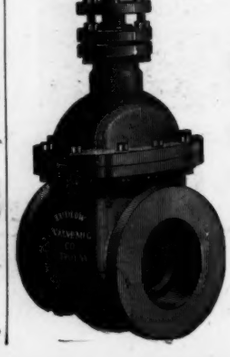
Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

70 Rush St., Near Division Ave., Brooklyn, N. Y.



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

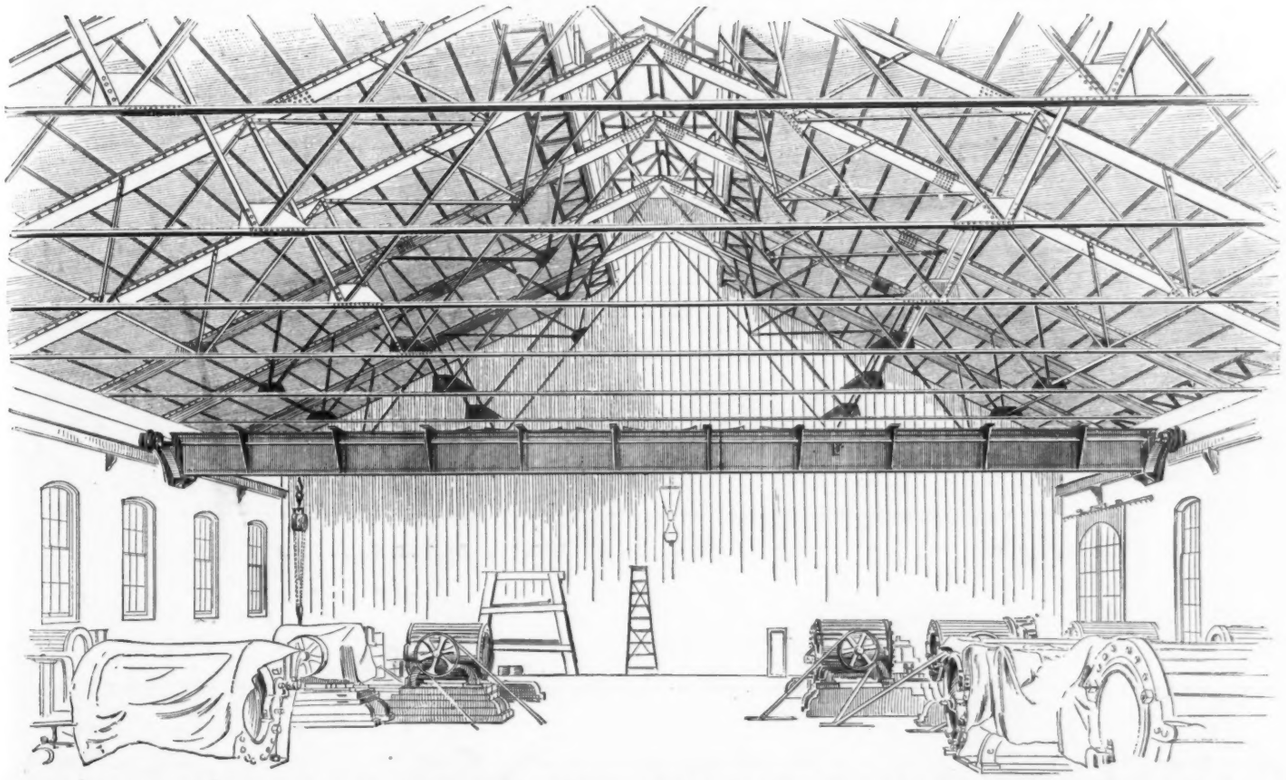
HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

CHARLES M. JARVIS, President. GEORGE H. SAGE, Secretary. F. L. WILCOX, Treasurer.

THE BERLIN IRON BRIDGE CO.

Engineers, Architects and Builders of Steel Structures.



The above illustration, taken direct from a photograph, shows the construction of an Iron Truss Roof with a Traveling Crane, both of which were designed and built by us for the Narragansett Electric Lighting Company, at Providence, R. I. The illustration is taken in the Dynamo Room, which is 60 feet in width by 200 feet in length. The side walls are of brick, with Iron Roof Trusses covered with our Patent Anti-Condensation Corrugated Iron. This is the first roof ever built with this Patent Anti Condensation Corrugated Iron, and after passing through three severe winters has shown no signs whatever of any dripping or sweating on the corrugated iron. We guarantee this Anti-Condensation Corrugated Iron Covering not to drip in the coldest weather.

BOSTON OFFICE, 200 Equitable Building.
NEW YORK OFFICE, 718 Bennet Building, Cor. Fulton and Nassau Streets.

Main Office and Works, EAST BERLIN, CONN.

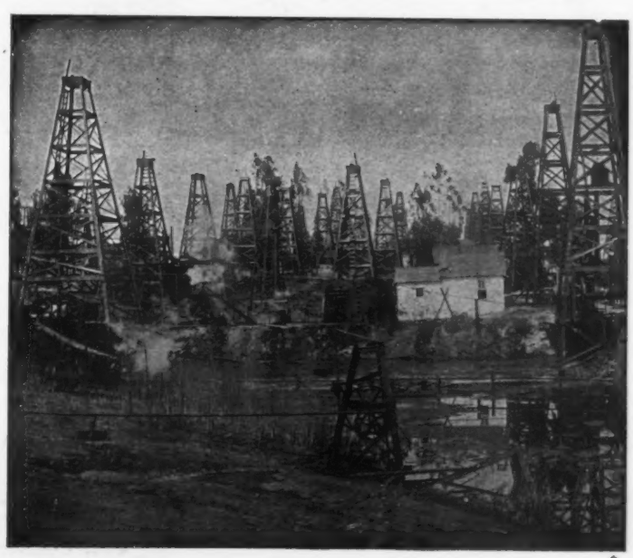
Gas Investments in California.

Nowhere else on this continent does such opportunity exist for profitable gas investment as on the Pacific Coast, since the perfection of the new LOWE Process for using the heavy crude California oils (of which there is an unlimited supply) without the use of any other fuels. Seven years' test proves the system to be perfect in every respect. Los Angeles alone, in addition to present street mains, has 150 miles of well built up streets without a gas main on them. To occupy this territory, and a large number of other towns now without gas, we have organized a parent company and a number of local companies covering some of the fastest growing cities in the United States.

Now is the time to invest, when the first capital will be able to double itself in a single year. This is also the most delightful residence section in the United States.

We suggest to those desiring gas investments, in large or moderate amounts—with or without active business connections—to come here and investigate; or, what is the next best thing, write us for particulars and prospectus.

The accompanying cut shows the oil wells in the suburbs of Los Angeles from which the Companies under the NEW LOWE GAS PROCESS obtain their supply of oil.



AMERICAN GAS & COKE CO. (T. S. C. Lowe, Manager),
406 Bradbury Building, Los Angeles, California.

AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

KLONNE-BREDEL

Recuperative Furnaces, Washers, Condensers, Purifiers and Purifying Machines, Ammonia Plant, Coke Conveyers, Etc.

Complete Works Erected with Guaranteed Results.

EASTERN AGENTS FOR

FRED. BREDEL'S SYSTEM
COAL GAS PLANTS AND GAS APPARATUS.

P. H. & F. M. ROOTS CO.'S
Exhausters, Blowers, etc.

222 South Third Street, Philadelphia, Pa.

GEORGE G. RAMSDELL, General Manager. **Correspondence Solicited**

FRED. BREDEL, C.E.

Coal and Water Gas Plants.

OWN SYSTEM.

RECUPERATIVE FURNACES, WASHERS, CONDENSERS, PURIFIERS, PURIFYING MACHINES, COKE CONVEYERS, ETC

SOLE UNITED STATES AGENT FOR
ARROL-FOULIS MECHANICAL CHARGING AND DRAWING MACHINES.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas

GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.

COMPLETE GAS WORKS

No. 118 Farwell Avenue, · Milwaukee, Wis.

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa

ROOTS'

LATEST IMPROVED GAS EXHAUSTER

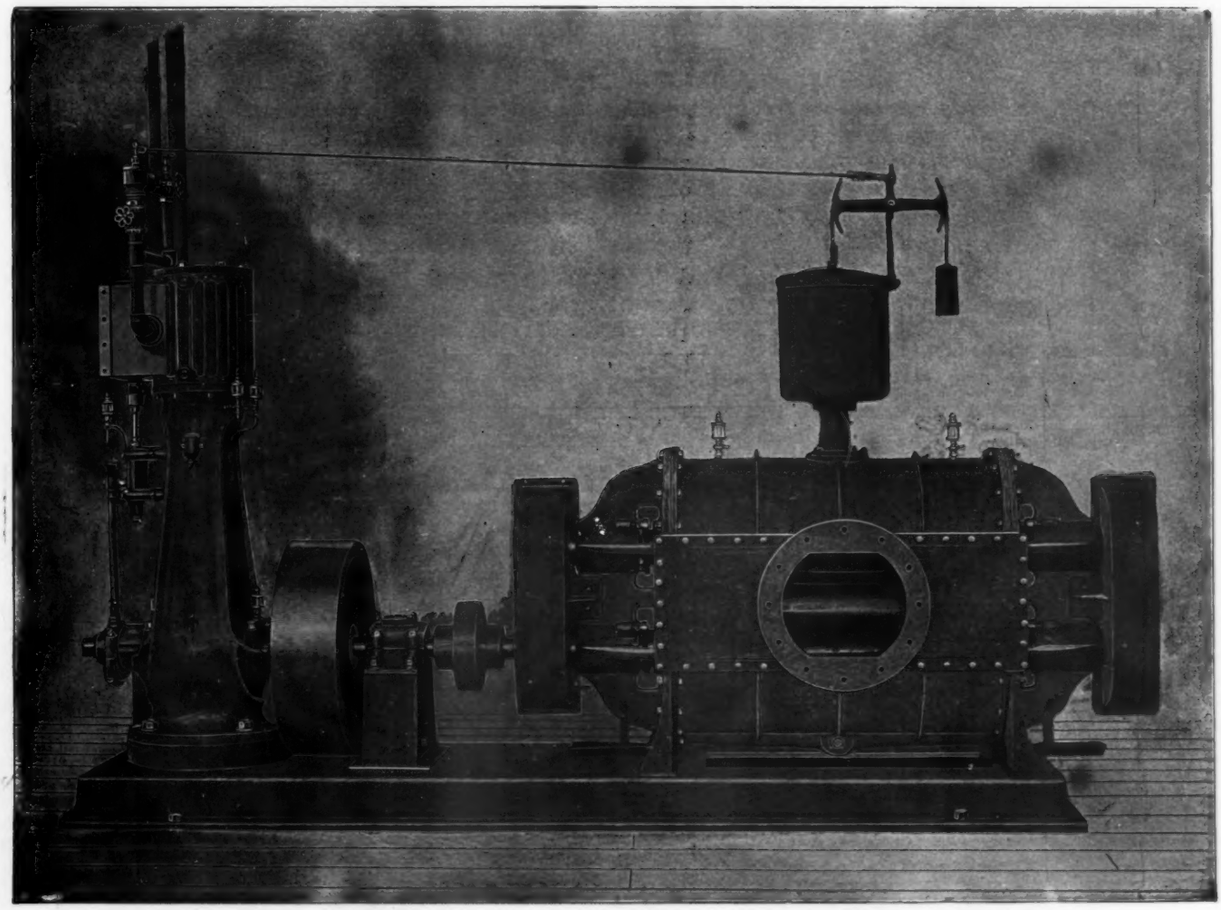
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

P. H. & F. M. ROOTS CO.,

Connersville, Ind. **109 Liberty St., New York.**

Eastern Office:

American Gas Company,

222 South Third Street, Philadelphia, Pa.

New York, 33 Nassau St. Philadelphia, Broad and Arch Sts. Chicago, 54 Lake St.

WELSBACH STREET LIGHTING COMPANY

OF AMERICA,

—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

STYLE No. 81.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

Lists of Cities and Towns in which we are now lighting under contract will be furnished upon application.

STYLE No. 97.

CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

NOW READY.

THE SIXTH (AND CENTENARY) EDITION
— OF THE —

Handbook for Gas Engineers and Managers.

By THOMAS NEWBIGGING, M. Inst. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

PRICE, - - $6.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, N. Y. City.

PRACTICAL HANDBOOK ON

GAS ENGINES

With Instructions for Care and Working of the Same.

By G. LIECKFELD, C.E.

Translated with Permission of the author by GEO. M. RICHMOND, M.E.

Price, $1.00.

A. M. CALLENDER & CO., 32 Pine Street, New York.

(Copyrighted, 1894, by the AMERICAN METER CO.

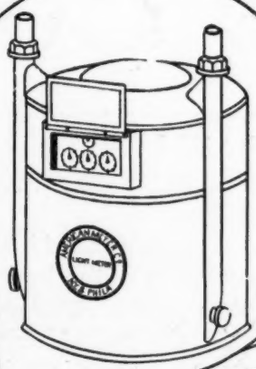
AMERICAN METER CO.

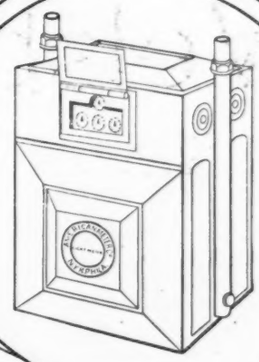
ESTABLISHED 1834. INCORPORATED 1863.

NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.

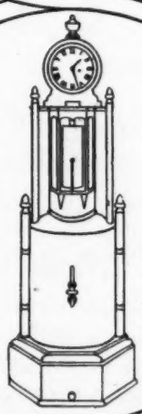


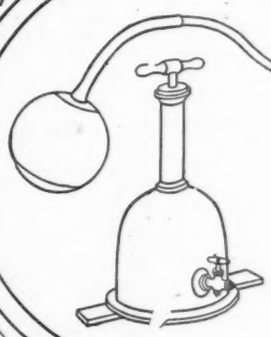


PUBLIC LIGHTING TABLE.

AUGUST, 1899.

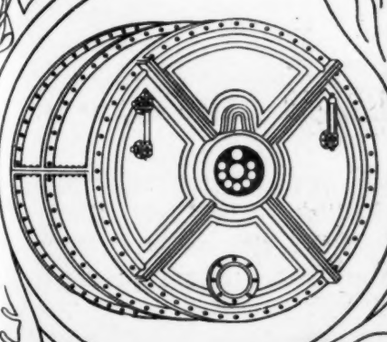
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	7.40 PM	2.20 AM	7.10	3.30
Wed.	2	7.40	4.00	7.10	3.30
Thu.	3	7.40	4.00	7.10	3.30
Fri.	4	7.40	4.00	7.10	3.30
Sat.	5	7.40 NM	4.00	7.10	3.30
Sun.	6	7.30	4.10	7.10	3.45
Mon.	7	7.30	4.10	7.10	3.45
Tue.	8	7.30	4.10	7.10	3.45
Wed.	9	7.30	4.10	7.10	3.45
Thu.	10	7.40	4.10	7.10	3.45
Fri.	11	8.10	4.10	7.10	3.45
Sat.	12	8 30	4.10	7.10	3.45
Sun.	13	9.10 FQ	4.10	6.55	4.00
Mon.	14	9.50	4.10	6.55	4.00
Tue.	15	10.50	4.10	6.55	4.00
Wed.	16	11.50	4.10	6.55	4.00
Thu.	17	1.00 AM	4.10	6.55	4.00
Fri.	18	2.40	4.10	6.55	4.00
Sat.	19	No L.	No L.	6.55	4.00
Sun.	20	No L. FM	No L.	6.45	4.10
Mon.	21	No L.	No L.	6.45	4.10
Tue.	22	7.10 PM	8.20 PM	6.45	4.10
Wed.	23	7.10	8.50	6.45	4.10
Thu.	24	7.10	9.30	6.45	4.10
Fri.	25	7.10	10.00	6.45	4.10
Sat.	26	7.10	10.40	6.45	4.10
Sun.	27	7.10 LQ	11.30	6.30	4.20
Mon.	28	7.10	12 20 AM	6.30	4.20
Tue.	29	7.10	1.10	6.30	4.20
Wed.	30	7.10	2.10	6.30	4.20
Thu.	31	7.10	3.10	6.30	4.20

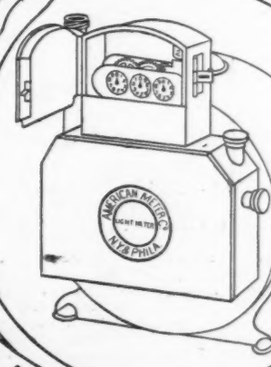




TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166.50	April	298.50
May	158.00	May	264.50
June	140.50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45





OFFICE OF THE

Welsbach Light Co.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23, 1899.

To the Stockholders of the Welsbach Light Company:

In answer to the many inquiries received from the stockholders as to whether the Welsbach Light Company is interested in the Kern Light or the Kern Incandescent Gas Light Company, I am authorized by the Board of Directors of this Company to advise you that **THIS COMPANY IS NOT NOW AND NEVER HAS BEEN INTERESTED IN EITHER THE KERN LIGHT OR THE KERN INCANDESCENT GAS LIGHT COMPANY. The Kern Light, or, to designate it more properly, the Kern Bunsen Burner for use with an incandescent mantle, and the United States patents upon which it is based, were offered to this Company, which refused to purchase them upon the advice of its experts, Dr. Charles F. Chandler, of Columbia College, and Dr. Waldron Shapleigh, its Chief Chemist, and of its Patent Council, Mr. John R. Bennett, of New York City.**

This Company is not now and never has been interested in the Welsbach Incandescent Gas Light Company of England, nor is that Company interested in this Company. Your attention is called to the following correspondence, which defines **THE POSITION OF THE UNITED GAS IMPROVEMENT COMPANY**, whose name is mentioned in the advertisements which offer for subscription the stock of the Kern Incandescent Gas Light Company.

WELSBACH LIGHT COMPANY,
W. E. BARROWS, President.

WELSBACH LIGHT CO.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23d, 1899.

MR. THOMAS DOLAN, President the United Gas Improvement Company:

DEAR SIR: In yesterday's and to-day's New York and Philadelphia papers appear the advertisements of the International Banking and Trust Company soliciting subscriptions to the Capital Stock of the Kern Incandescent Gas Light Company. Among the names of the Directors of the said Trust Company published in the advertisements referred to appears the name of "George W. Elkins, United Gas Improvement Company, Philadelphia." As the United Gas Improvement Company has been prominently identified with the Welsbach Light ever since its introduction into the United States, the publication of its name in these advertisements, which also contain suggestions hostile to this Company, has greatly disquieted many of our shareholders. If you are willing to give me an authoritative statement of the position of the United Gas Improvement Company I shall be greatly obliged. Very truly yours,

W. E. BARROWS, President Welsbach Light Company.

THE UNITED GAS IMPROVEMENT COMPANY,
Broad and Arch Sts., Philadelphia, June 23d, 1899.

COL. W. E. BARROWS, President Welsbach Light Company:

Dear Sir: Answering your favor of even date, the United Gas Improvement Company is not now and never has been interested either in the Kern Incandescent Gas Light Company or in the International Banking and Trust Company. Mr. George W. Elkins is neither an Officer nor a Director of the United Gas Improvement Company, and does not represent the United Gas Improvement Company. Very truly yours,

THOMAS DOLAN, President,
United Gas Improvement Company.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Under Contract, 1899:

	SETS.	DAILY CAPACITY.
Fostoria, O.	1	250,000 Cubic Feet.
Derby, Conn.	1	750,000 "
Lowell, Mass.	1	1,000,000 "
Doylestown, Pa.	1	50,000 "
Darby, Pa.	1	400,000 "
Adrian, Mich.	1	125,000 "
Concord, N. H.	1	400,000 "
Sioux City, Iowa	1	750,000 "
Standard Gas Light Co., New York	3	5,400,000 "
Peekskill, N. Y.	1	250,000 "
Westchester, N. Y.	1	250,000 "
Jersey City, N. J.	1	1,000,000 "
Stapleton, N. Y.	1	750,000 "
London, O.	1	125,000 "
Chicago, Ills.	2	3,600,000 "
Putnam, Conn.	1	125,000 "
Mansfield, O.	1	250,000 "
Plymouth, Pa.	1	125,000 "
Athens, Pa.	1	125,000 "
Charlotte, N. C.	1	250,000 "
Total	23	15,975,000 "
Previously built	294	187,100,000 "
Grand Total	317	203,075,000 "

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY. Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

ESTABLISHED IN 1845.

B. KREISCHER & SONS,

Office, 119 E. 23d St., New York.

Gas Retorts,

TILES, FIRE BRICK.

AND EVERYTHING IN THE FIRE CLAY LINE.

Adam Weber,

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Hamilton Building, Fifth Avenue
PITTSBURGH, PA. P. O. Box 373

Successor to WILLIAM GARDNER & SON

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. Galesburg or Mount Vernon.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

Eastern Agent. PERRY BORDEN, 19 Prospect Ave., MOUNT VERNON, N. Y.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec'y
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE
RETORT & FIRE BRICK CO.

MANUFACTORY AT
LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 10x10x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

PRACTICAL PHOTOMETRY.

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations. Price, $3.00 A. M. CALLENDER & CO., 32 Pine Street, N. Y. City

National Gas and Water Company.

CONTRACTORS FOR
Gas Plant Machinery

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

Gas Engineers
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR.
OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.

Hughes' "Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

The Gas Engineer's Laboratory Handbook.

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street, N.Y. City.

The Chemistry of Illuminating Gas.

By NORTON H. HUMPH Price, $2.40.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY

Cyanogen.

A PURIFYING MATERIAL FOR GAS.

Soft and porous, it can be used in the natural state without any preparation, and it ensures perfect purification.

SPECIMENS AND PRICES ON APPLICATION.

VAN BAARDA & CO.,
MINE OWNERS,
DUSSELDORF-ON-THE-RHINE.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREZEE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY

H. E. PARSON, Supt., 67 Bremen Street, Brooklyn, N. Y.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

SCIENTIFIC BOOKS.

NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.

COX'S GAS FLOW COMPUTER. $2.50.

HUGHES' GAS WORKS. $1.65.

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor. $3.50.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.

CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.

PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

GAS WORKS: Their Arrangement, Construction, Plant and Machinery. $5.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

GASFITTER'S GUIDE, by John Eldridge 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2

CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.

DIGEST OF GAS CASES. $5.

PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT; A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.

A COMPARISON BETWEEN THE ENGLISH AND FRENCH METHODS OF ASCERTAINING THE ILLUMINATING POWER OF COAL GAS. $1.60.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

MAGNETISM AND ELECTRICITY. By J. Overend. 40 cts

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point Baltimore, Md.
OFFICE, - 640 Equitable Building Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS, { BANGS & HORTON 60 Congress St., Boston.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50. For sale by

A. M. Callender & Co., 32 Pine St., N. Y.

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened and Prepared for Gas Purposes.

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

Room 720, Reading Terminal Building, Phila., Pa.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River: Pier No. 1 (Lower Side), South Amboy, N. J.

EDMUND H. McCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

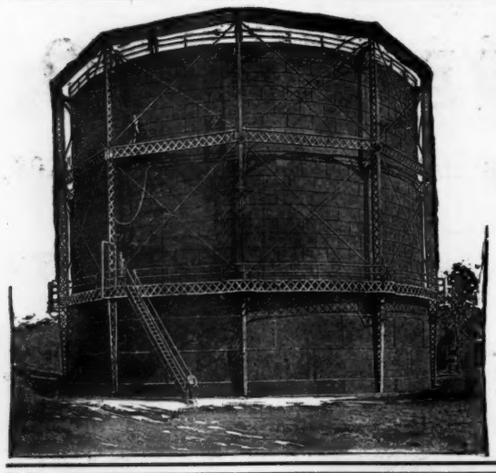
GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.



DAVIS & FARNUM MFG. CO.,
WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

BAXTER & YOUNG,
CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED:

Artificial and Natural Gas Mains Furnished and Laid.

CORRESPONDENCE SOLICITED.

OFFICE: WAYNE COUNTY BANK BUILDING,
Rooms 201 & 202. DETROIT, MICH.

A. E. BOARDMAN, C. E.,
Consulting and Contracting Engineer.

Particular attention given to Gas, Water and Electric Plants. Long and successful experience with the problem and practice of

Filtration for Public Water Supply.

BREVARD, N. C.

Geo. Shepard Page's Sons.
GAS MACHINERY.

Correspondence Solicited.

69 Wall Street, New York City.

JAMES T. LYNN,
GAS ENGINEER AND CONTRACTOR,

Wayne Bank Building, - DETROIT.

GAS PROPERTIES PURCHASED.

DAVID LEAVITT HOUGH,
Consulting Engineer AND CONTRACTOR,

374 FIFTH AVE., N. Y.

Kerr Murray Manufacturing Company,
Steel Gasholder Tanks,
SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,
HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.

Address,

KERR MURRAY MANUFACTURING CO.
Fort Wayne, Indiana.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

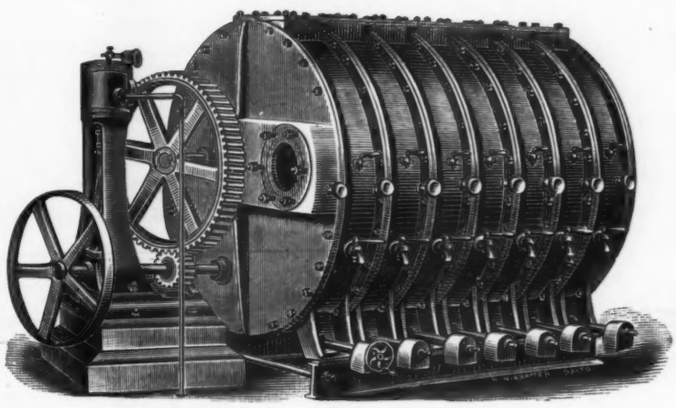
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSIBLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

EXCERPTS FROM DECISIONS

—OF THE—

BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations, and rights of Gas Companies. Your little book will serve as a valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

Yours truly, (Signed) F. C. SHERMAN, Superintendent.

A 28-page Pamphlet containing the cream of this Board's decisions as to the proper management of Gas Companies.

Compiled by E. H. YORKE. Price $1.00. Address

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.

Foundries and Works: { Millville, N. J. / Florence, " / Camden, "

R. D. WOOD & CO.

ENGINEERS, IRON FOUNDERS, MACHINISTS

400 Chestnut Street, PHILADELPHIA, PA.

MANUFACTURERS OF

Cast Iron Pipe.

SOLE MAKERS OF

THE MITCHELL SCRUBBER
(PATENTED)

PURIFIERS, CONDENSERS,
SCRUBBERS, BENCH WORK.

BUILDERS OF

Gas Holders.

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks.

PEASE'S PATENT WIRE ROPE GUIDING FOR GAS HOLDERS.

CUTLER'S PATENT FREEZING PREVENTER
For Gas Holder Cups.

THE TAYLOR
REVOLVING BOTTOM GAS PRODUCER.

HEAVY LOAM CASTINGS, DUNHAM SPECIALS, HYDRAULIC WORK, LAMP POSTS, VALVES, Etc.

ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

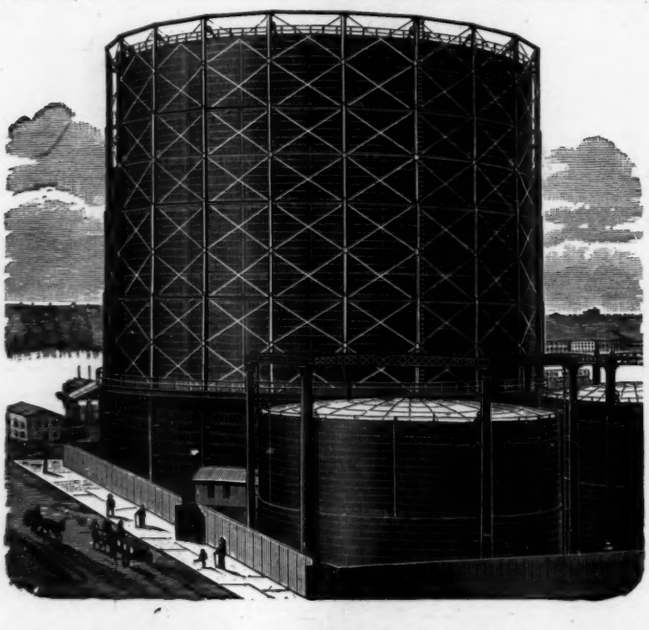
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. OFFICES Bridge & Ogden Sts., Newark, N. J.



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

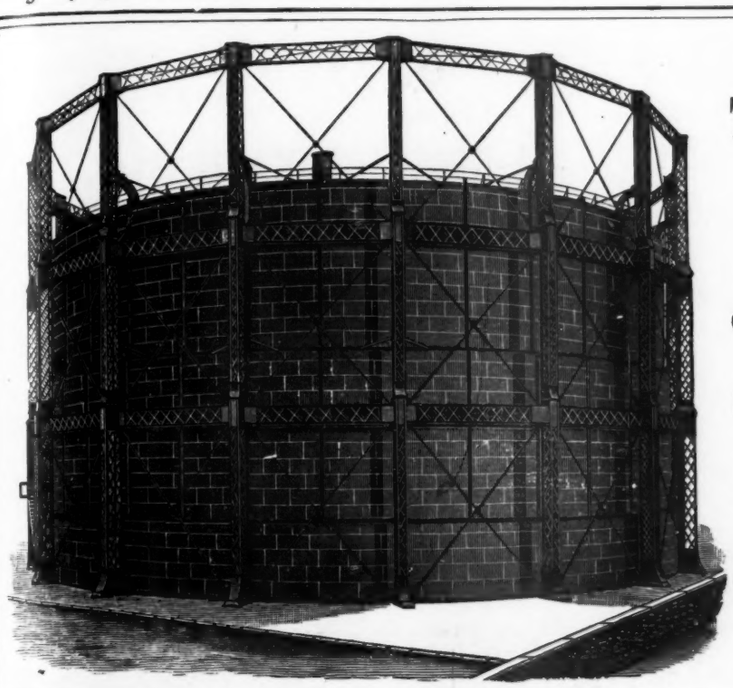
BURDETT LOOMIS, - - Hartford, Conn.

To Gas Companies.

We make to order CAP BURNERS to burn any amount under a stated pressure. Send for samples.

Also SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
248 N. 8th St., Phila., Pa.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr.
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO
Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

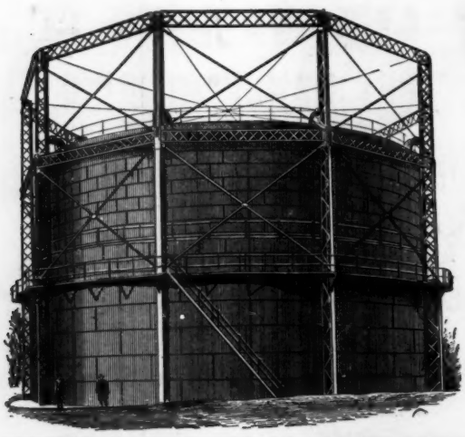
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited. Plans and Estimates Furnished.

1899 DIRECTORY 1899

OF AMERICAN GAS COMPANIES

Price - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.



1842 ❊ Deily & Fowler, ❊ 1899

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

JAMES R. FLOYD'S SONS,

Successors to HERRING & FLOYD,

Oregon Iron Works,

West 20th and 21st Streets, Between 10th & 11th Avenues, New York City.

Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF ALL KINDS OF CASTINGS AND GENERAL IRONWORK FOR GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings, Condensers, Tower Scrubbers, Mechanical Scrubbers, Purifiers, Malleable Iron Retort Lids, Self-Sealing Retort Lids, Hydraulic Hoist Purifier Carriage, Crosses, Tees, Bends, Angles, Reducers, S-Bends, Sectional Sleeves, Plugs, Caps, Street Drips, etc., always on hand.

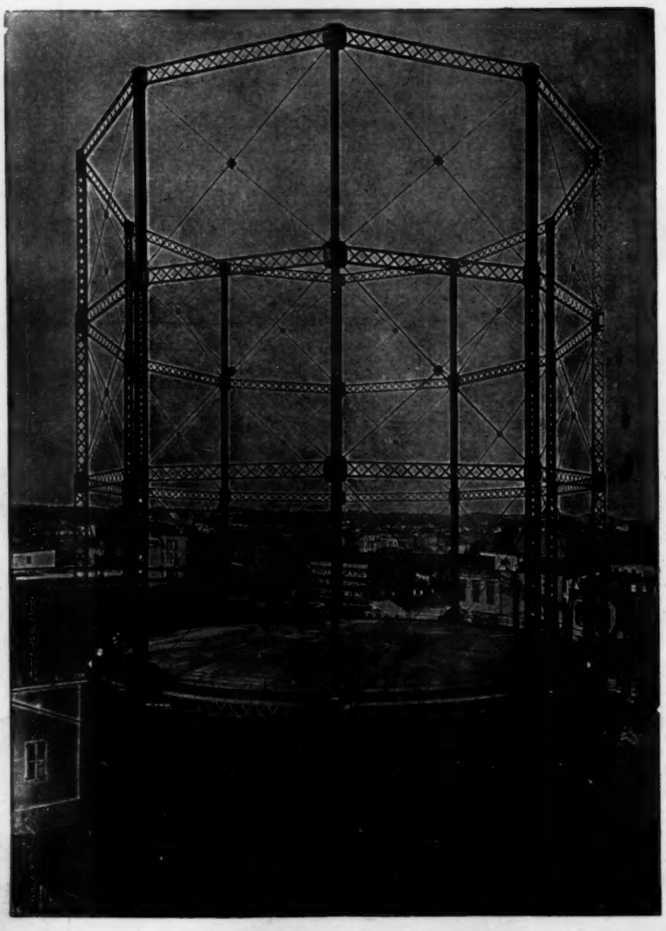
WOOD'S GAS SCRUBBING AND ENRICHING APPARATUS.

In use at Syracuse, Auburn, Watertown, Cortland and Geneva, N.Y.; Elizabeth, N. J.; Boston, Mass.; Jamaica Plain, Mass.; Providence, R. I.; Northern Liberties Gas Co., Phila.

Sole Manufacturers of the OGDEN QUICK-MOVING VALVE.

HEARNE CENTER SEAL, Operating One, Two, Three or Four Boxes.

Stroh & Osius Concentrator for Ammoniacal Liquor, used by 50 Gas Companies and Cokeries during the past 4 years.



The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.

LOGAN IRON WORKS,

Brooklyn, N. Y.

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete with Steel Tanks.

BENCHES, SCRUBBERS,

CONDENSERS,

PURIFIERS, IRON ROOFS,

Self-Sealing Retort Lids,

AND ALL PARTS OF

GAS WORKS APPARATUS.

Contractors for Complete Works.

ALSO, SOLE MANUFACTURERS OF

C. W. BLODGET'S

HOT GAS SCRUBBER.

YOU CAN GET A PATENT

For any Invention. Send me particulars and a rough sketch for advice, free.

IMPORTANT to have your attorney at Washington, saving time and expense.

HENRY S. THORNBERRY, Patent Solicitor, 1427 F STREET, N. W., WASHINGTON, D. C.

BINDER for the JOURNAL.

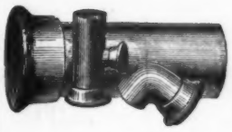
Price $1.00.

A. M. CALLENDER & CO., 32 Pine Street, N.Y.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches. Bends, Retorts, etc., etc

"GLOBE" SPECIALS, VALVES, ETC. M. J. DRUMMOND & CO. "GLAMORGAN" FIRE HYDRANT

MANUFACTURERS OF CAST IRON FLANGE GAS AND WATER PIPE

GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.

Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

CHARLES MILLAR & SON, Selling Agents, Utica, N. Y.

Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.

Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers and Tinners Goods.

CAST IRON PIPE and SPECIALS FOR WATER AND GAS.

Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

Established 1854.

D. McDONALD & CO.,

MANUFACTURERS OF

WET AND DRY METERS, STATION METERS AND METER PROVERS.

—ALSO MAKERS OF

THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES

OVER 30,000 OF THESE METERS,

ALL OF WHICH ARE GIVING PERFECT SATISFACTION.

Correspondence Solicited.

511 West Twenty-first Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

NATHANIEL TUFTS METER CO.

ESTABLISHED 1849. No. 8 Medford Street, BOSTON, MASS.

Manfrs. of Consumers', Station, Test and Experimental Meters.

Sole New England Agents for the

PERFECT GAS RANGES.

In competitive tests it shows the greatest Efficiency, Durability, and Saving in Repairs.

Made in four grades, with Price and Size to suit any condition. We Guarantee every Range.

SEND FOR A SAMPLE AND MAKE YOUR OWN TESTS.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**
SAN FRANCISCO, 221 Front St.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Perfect" Gas Stoves

MORE OLD METERS

for Repairs have come to us this year than in the entire three years previous. . . . . .

WE HAVE A SEPARATE SHOP

for Repair work, receive Meters of all makes, and employ a large force of men. Return all moderate sized lots of one hundred or under, in Ten days to two weeks.

WORK GUARANTEED.

KEYSTONE METER CO.,
ROYERSFORD, PA.

American Meter Co.

NEW YORK, PHILADELPHIA,
SAN FRANCISCO.

Prepayment Meters.

Their construction is such that they may be readily readjusted when the scale of gas rates is changed.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

This is the best time to look after your repairing.

Seventy per cent. of old meters run slow. You are losing money on them. Let us put them in shape for you, a few at a time, until your entire meter equipment is made as good as new. It is better to attend to this matter now, before the Gas Stove season is at its height. Probably we can do such work in our factory better and cheaper than you can do it at home, and just now we can do it promptly.

The BUHL METERS are as good Meters as you can get.

DETROIT METER COMPANY, = = Detroit, Mich.

The Advertisement of

JOHN J. GRIFFIN & CO., Mfrs. of Gas Meters, etc.,

Nos. 1513, 1515, 1517, 1519 & 1521 Race Street, Philadelphia,

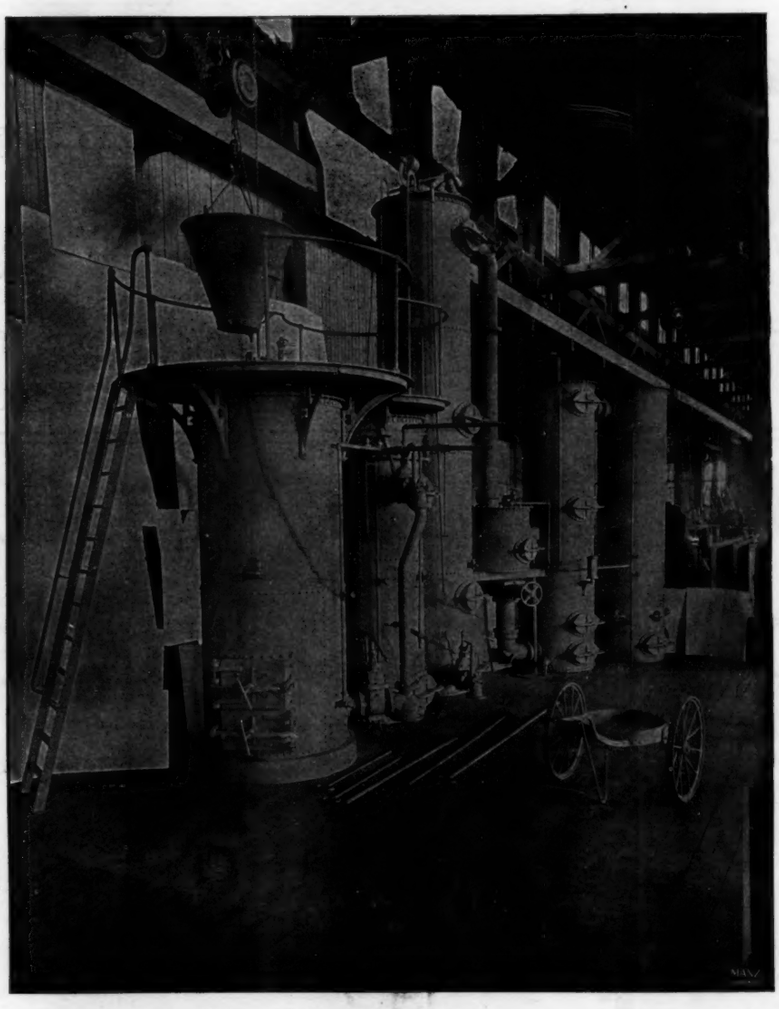
52 Dey Street, New York, 75 N. Clinton Street, Chicago,

Occupies this space every alternate week.

WHEN A GAS MAN KNOWS

THAT HIS

This is not special—it happens to all, only the others haven't the honor of appearing in the JOURNAL.



If you elsewhere see this style of AUTOMATIC FUEL CHARGING DEVICE;
If you elsewhere see this style of DOUBLE SUPER-HEATER PLATFORM APPARATUS;
REMEMBER, it has been COPIED BODILY FROM US.

IMPROVED LOWE WATER GAS APPARATUS

Is **completely put together** in our shop before shipment, being only dismantled sufficiently for transportation, **he has an assurance,** not otherwise possible, that when it is re-erected in his works **it will fit, and Look to Fit, and, most important, IS FIT.**

WILLIAM HENRY WHITE,
EASTERN ENGINEER,
32 Pine St., New York.

The Western Gas Construction Co.,
FORT WAYNE, INDIANA.